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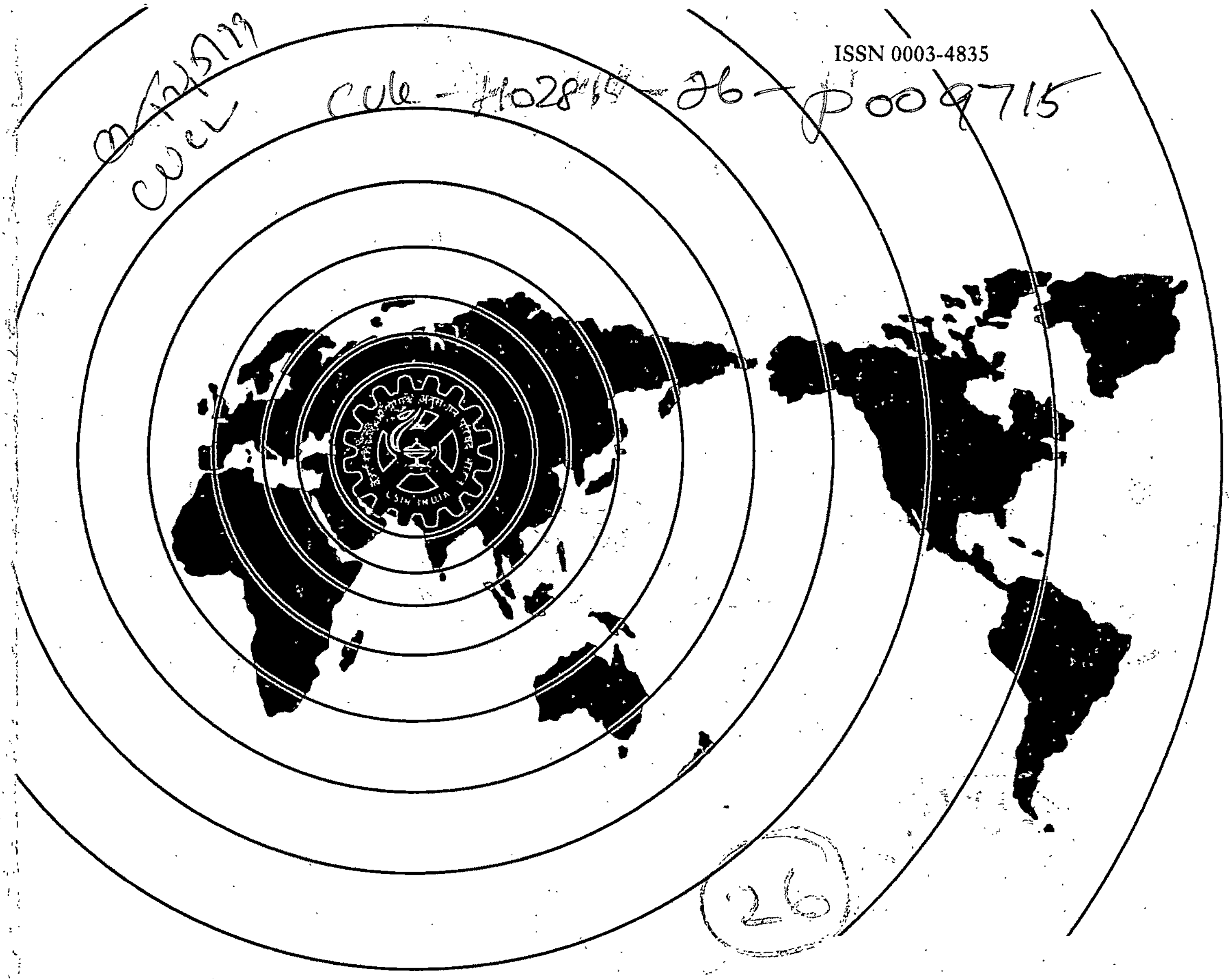

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QUANTITATIVE EVALUATION OF SELECTIVE DISSEMINATION OF INFORMATION (SDI) SERVICE: STUDY OF NATIONAL CENTRE FOR SCIENCE INFORMATION (NCSI), BANGALORE

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National Centre for Science Information (NCSI), Bangalore is providing computerised batch (offline) SDI-services to the scientists residing all over India. BIOSIS, INSPEC, MATHSCI, CA-Search and Geo ref databases are being made use of for the purpose. The profile of 135 users of these five databases, on evaluation, revealed that precision ratio of the profile of users of INSPEC database was the highest and that of CA-search database, the least. The novelty ratio of the MATHSCI database was the highest and that of the CA-search database, the least.

INTRODUCTION

National Centre for Science Information (NCSI) which is located at Indian Institute of Science (IISc) campus, Bangalore is providing Selective Dissemination of Information (SDI) service to the researchers working all over India. BIOSIS, INSPEC, MATHSCI, CA-Search and Geo Ref databases are being made use of to provide the SDI service. The quantitative evaluation of SDI service of NCSI was undertaken mainly to measure the precision and novelty of the user profiles of various databases.

An ideal information system should be able to provide the user the needed information, in a form in which he can make use of and at the appropriate time when he needs it. It is difficult, almost impossible to achieve an ideal information system. All information systems strive hard to improve the performance to meet the user needs effectively and the performance to meet the user needs effectively and to carry out its functions effectively. Information scientists/system analysts try to evaluate the system performance from time to time to see whether the users are being served with needed information and to find out whether the cost incurred is worthwhile.

The establishment, maintenance and the continuation of any activity/service involves cost. Lots of human and non-human resources are required for any service: For an existing service some times a question arises as to whether it is worthwhile to continue a service or not. It is therefore required to know the value of such a service. Hence an evaluation of the service is conducted. The results of the evaluation of the SDI service have to be incorporated so as to improve the performance. Otherwise, the effort on evaluation is a waste. Service can be evaluated by the agency/organisation which provides it to know whether it satisfies the needs of its users or not.

TYPES OF EVALUATION

There are two types of evaluation viz. quantitative and qualitative. They are not mutually exclusive categories and compliment each other. Quantification will be done when there are good reasons to do so. Assessments based on qualitative judgements also contribute significantly towards the evaluation of the services.

Most of the evaluations attempt to measure system performance through recall and precision. Performance measures can be undertaken to measure system effectiveness. Here criteria for evaluation is how well the system satisfies the purpose for which it is designed. Performance measure can also be undertaken to measure system efficiency, where the amount of time and money taken to perform a given task will be measured. Usually performance measures also undertake the work of knowing user reaction to the system to investigate overall impact of the service.

Evaluation data is of use to both the system operators and researchers in the scientific communication process.

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PRECISION

Precision being a measure of evaluation of information retrieval, gives a quantitative indication of the performance of a user profile. According to Lancaster, "The term precision refers to a measure of signal-to-noise ratio in certain kinds of information systems" [1]. Out of the 100 references received by a user, if 10 are judged as relevant by the user, we can say that precision ratio is 10/100 or 10%. A document is said to be relevant when it has been judged as relevant to the request by an individual or a group of individuals.

The degree of precision can be expressed as a ratio.

$$\text{Precision Ratio} = \frac{\text{Total number of relevant references}}{\text{Total number of references retrieved}} \times 100$$

According to Vickery and Batten, "Precision is an arbitrary measure and does not refer to the real value to the user, it does, however, give a quantitative indication of the performance of the profile" [2].

NOVELTY

According to Lancaster, novelty is, "..... the proportion of relevant items retrieved in a search that are new to the requester, that is, brought to his attention for the first time by the search". [3].

According to Vickery and Batten, "This is a measure of the number of relevant references retrieved which are not already known to the user" [4].

$$\text{Novelty Ratio} = \frac{\text{Total number of new relevant references retrieved}}{\text{Total number of references retrieved}} \times 100$$

To calculate the precision and novelty ratios the following information was gathered from the users from the previous 12 SDI notifications:

i) Number of references retrieved; Total number of references retrieved in each notification for the previous 12 (twelve) notifications.

ii) Number of relevant references: Total number of new relevant references retrieved in each previous 12 (twelve) notifications.

iii) Number of new relevant references: Total number of new relevant references retrieved in each previous 12 (twelve) notifications.

METHODOLOGY

For the purpose of the study, 62 (sixty two) users of BIOSIS databases, 45 (forty five) users of INSPEC database, 14 (fourteen) users of MATHSCI database, 09 (nine) users of CA-search database and 05 (five) users of Geo Ref database were asked to evaluate at least previous 12 (twelve) notifications received by them, through an interview.

The aim of the interview was to obtain a quantitative measure of whether or not each profile was working and to establish whether or not new and useful information was being retrieved in advance of the user finding this through customary channels.

information gathered was made use of to calculate precision and novelty ratio for each profile. (Annexure 1). In all a total of 135 (one hundred thirty five) scientists were involved in the study with each scientist having only a single profile.

Recall is the measure which shows how many of the relevant items in the system the profile index has managed to retrieve.

$$\text{Recall} = \frac{\text{number of relevant items retrieved}}{\text{total number of relevant items in the system}} \times 100$$

Recall and precision are the two fundamental quantitative measures which are normally made use of to evaluate any information system. Recall measures could not be carried out in the present evaluation, mainly because of the fact that scientists involved in the evaluation could not find time to go through the entire bibliographic database in order to find out the relevant references missed by the SDI system. Only those users who are working

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and residing in Karnataka State of India were selected for the study.

AVERAGE PRECISION AND NOVELTY

Each user profile has its own uniqueness; it has its own effect on the retrieval. Without knowing the efficiency of the use of the profile the study of the SDI service is incomplete. Hence it was decided to measure the precision and novelty of the user profile. The average precision and novelty for various databases for 12 notifications have been studied. The results of the study are presented in the table1.

Table 1

Average Precision & Novelty

Sl. No.	Measure	Database					Average
		BIOSIS %	INSPEC %	MATHSCI %	CA-Search %	Geo Ref %	%
01.	Precision	42.34	56.82	42.35	26.69	38.41	41.92
02.	Novelty	34.15	30.59	35.64	18.97	33.97	30.66

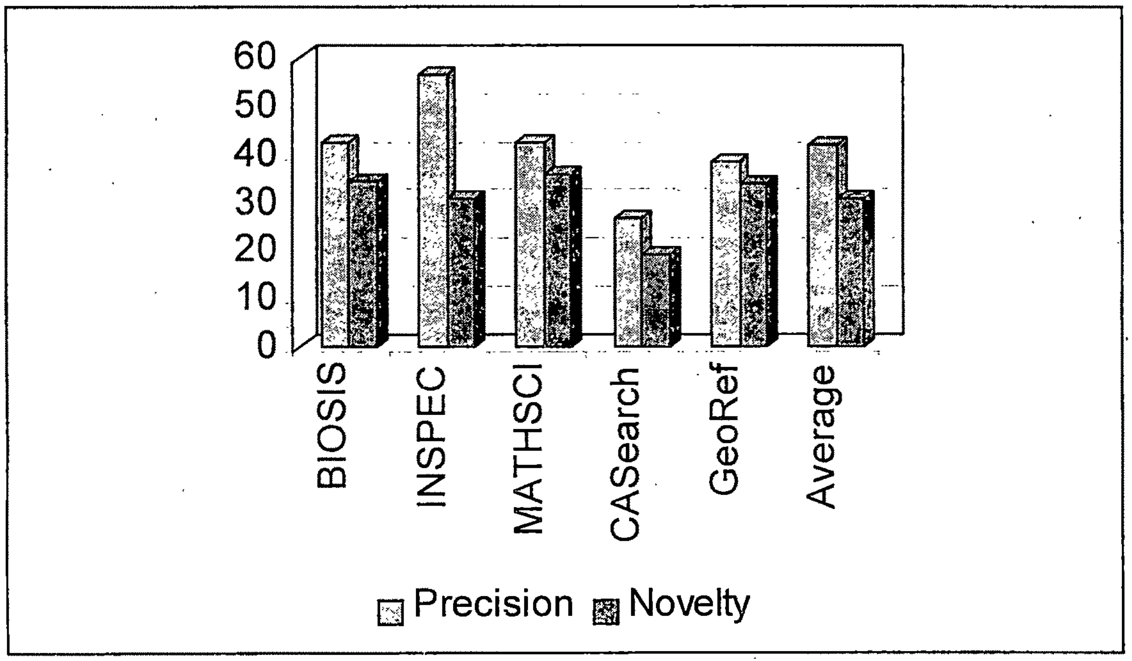

Fig. 1 : Precision & Novelty

Users of BIOSIS Database

For 62 profiles analysed for precision, the average precision for the users of BIOSIS database was 42.34%. The average novelty of profile of users of BIOSIS database for the 62 profiles analysed was 34.15%.

This means that on an average around 42.34% references retrieved per SDI notification were considered relevant by the users. Novelty worked out shows that 34.15% were new relevant references to the users.

Users of INSPEC Database

The average precision worked out for 45 profiles of users of INSPEC database was 56.82% and the average novelty worked out for profile of users of INSPEC database was 30.59%. Precision worked out for the profiles of the respondents of INSPEC database was 56.82%. This means that on an average around 56.82% references retrieved per SDI output were considered relevant by the scientists. Novelty worked out for each profile of users of the INSPEC database was 30.59%. This shows that on an average among the total number of references retrieved, 30.59% references were considered relevant by the users.

Users of MATHSCI Database

For the 14 profiles analysed for precision, the average precision was 42.35% and for novelty, the average novelty was 35.64%.

Precision worked out for each profile of the users of MATHSCI database was 42.35%. This means that on an average around 42.35% references retrieved per SDI notification were considered relevant by the researchers. Novelty worked out for each profile was 35.64%. This shows that on an average among the total number of references retrieved 35.64% references were new relevant references to the users.

Users of CA-Search Database

The average precission worked out for 9 profile of users of CA-Search database was 29.69%. The average novelty worked out for 9 profile of users of CA-Search database was 18.97%.

Precision worked out for each profile of users of CA-Search database indicates that, on an average out of the total number of references retrieved only 29.69% references were considered relevant references by the respondents. Novelty worked out for each profile was 18.97%. Out of the total number of references retrieved 18.97% were new relevant references to the users.

Users of Geo Ref Database

For 5 profiles analysed for precision, the average precision was 38.41%. For 5 profiles analysed for novelty, the average novelty for the users of Geo Ref database was 33.97%.

Precision of 38.31% for each profile of users of Geo ref database indicates that around 38.41% references retrieved per SDI notification were considered relevant by the users. Novelty of 33.97% indicates that on an average, among the total number of references received, 33.97% references were new relevant references to the users.

CONCLUSION

It was understood from the analysis that all the user profiles were working well and were retrieving good number of references. The comparison of precision and novelty for each profile of the users of the various databases studied shows that precision calculated for INSPEC database users was the highest. Users of INSPEC database found more number of relevant references through SDI notifications. Precision worked out for the users of CA-search database was the least. The users of CA-search database found less relevant references compared to the users of other database.

In order to provide more number of relevant references and new relevant references to the scientists of the CA-Search database, it is essential to construct the user profile using only the pertinent terms of scientists' research interest and to get the externally acquired database without much delay. The database used should have only current references.

Novelty worked out for each profile of users of MATHSCI database was the highest compared to the users of other databases. This indicates that users of MATHSCI database found more number of new relevant references amongst the total number of references retrieved. Novelty worked out for each profile of the users of CA-Search database was the lowest compared to the users of the rest of the databases. The users of CA-search database did not find many new relevant references amongst the total number of references received.

Precision and novelty worked out for the profiles of the users of CA-search database was less compared to the users of other databases. We can infer from the analysis that the users of CA-Search database did not find much relevant and new relevant references from the SDI service.

The average precision and novelty worked out for the profile of users of BIOSIS, INSPEC, MATHSCI, CA-Search and Geo Ref databases are shown in the figure (fig. 1). We can conclude from the analysis that 41.92% of the scientists who subscribed to the SDI services rendered by NCSI found relevant references and 30.66% found new relevant references.

Precision could be low because of different reasons like unrelated terms in the user profile, which in turn is retrieving unwanted references. Novelty which is less than one third can be brought to higher levels provided speed is achieved at different levels including the storing of the data in the database, matching the user profile with the document profile and mailing of the notification. If the data stored in the database is old it will lead to lower percentage in novelty ratio. Novelty could be improved by storing recent information in the database.

The results of the evaluation is an indication of the healthy condition of the SDI system. All the 135 user profiles were retrieving good number of relevant references. Despite growing trends that threaten to diminish the role of the librarian/information scientist in the information age, value added services like SDI can contribute significantly to the needs of the specialists and thereby enhance the role of the librarian/information scientist.

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Appendix-I

Interview Schedule

Quantitative Evaluation:

This question is crucial for the evaluation of the Selective Dissemination of Information Services. Please go through at least previous 12 notifications sent to you by the Information Centre. Find out the total number of useful relevant references among the references received. Find out the number of new references which you are seeing for the first time.

For example, if you have received a notification on 22nd January, 1993, containing 10 references, out of which only 6 may be relevant to you, among the 6 relevant references only 4 references may be new to you and other 2 references might have been known to you earlier. (i.e. through informal methods, current contents, abstracts, journals etc.). So you have to write it as:

- References received on: 22/01/93
- No. of references received: 10
- No. of references which are relevant: 6
- No. of new references: 4

Note: Please evaluate at least previous 12 notifications received during the past one year.

1. Name and Address:

2. Name of the organisation:

3. a) References received on:								
b) Total no. of references:								
c) no. of relevant references (no. of references considered useful even if already known)								
d) no. of new references (within the no. of relevant references; useful references, not already known)								

Thank you for your co-operation

Date:

Signature

Annals of Library Science and Documentation 45, 1; 1998; 7-31.

NETWORKING OF DRDO LIBRARIES COLLECTION: PROBLEMS & PROSPECTS

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The paper presents data pertaining to the library collections. computer hardware, software, library staff, databases, etc. in 26 DRDO libraries in India. Concludes that networking of DRDO libraries would help in resource sharing by the libraries.

INTRODUCTION

In the present society, the library and information centres have to meet diverse, multifaceted and multidimensional information needs of their users. As none of the libraries are self-sufficient in their resources, they have to depend on others in sharing resources. Networking of libraries and information centres is thus an urgent need of the present era.

With information explosion and shrinking library budgets in real terms, libraries find it more and more difficult to acquire comprehensive collections in the fields of their interest. This situation has led to the creation of databases covering information of interest available in various countries for providing relevant information to the users. Also emphasis has shifted from comprehensive acquisition of documents in libraries to providing access to comprehensive information (or literature) to the users of libraries. This has necessiated the formation of library networks for resource sharing.

DRDO LIBRARIES IN R&D

Information is a vital resource for research and development (R&D) as scientists need information on the work being done or already done elsewhere to corroborate their work. Such information made available at the right time, in the right form would result in more efficient and fruitful R&D programmes.

Realising this, Defence Research and Development Organisation (DRDO) Laboratories have established good library services. Some of the DRDO Laboratories Libraries are termed as Technical Information Centres (TIC). Presently, the libraries/TICs of DRDO are the central information agency for collection, processing and dissemination of scientific and technical information of interest to the parent laboratory.

There are forty six libraries/TICs attached to laboratories catering to various subjects and all of them are involved in information processing. These laboratories are spread around all over the country. A list of DRDO Libraries/TICs alongwith their abbreviated forms are given in Appendix-1. Library budget of DRDO Libraries for procurement of books and journal stands at Rs. six crores approximately.

SCOPE & METHODOLOGY

The scope of the present study encompasses all the aspects related to various DRDO Libraries/ Technical Information Centres, however in this paper only aspects related to collection and networking have been discussed. The questionnaire method was adopted to approach the problem. Technical discussions and interviews were also held wherever it was feasible and considered necessary. Questionnaires (Appendix-2) were circulated to all 46 laboratories and subsequently three reminders were sent to return duly filled in questionnaires. Certain libraries were visited and some questionnaires were filled in after interview of library staff. Inspite of all above efforts only 28 questionnaires were received which amonts to approximate 65% response.

ANALYSIS

There are 46 laboratories but some of the laboratories are field laboratories meant for recording data and trials only under extreme conditions such as Field Research Laboratory (FRL) (Leh), Snow and Avalanche Studies Establishment (SASE) (Manali) and Proof and Experimental Establishment (PEE) (Balasore). These laboratories do not have a library of technical nature.

Similarly there are some laboratories located close to extremely rich DRDO libraries. Therefore, these laboratories do not have library/TIC of their own but they are using rich libraries of the region such as DTRL, DSC, and CEES. All these laboratories are located in Metcalfe House and using DESIDOC (located in the same campus) library for needs of their technical information. Therefore, there are 40 libraries/TIC's available in DRDO with library collection.

The analysed data on collection (table 1) indicates that 28 DRDO libraries are having 3,37,250 books, presuming 20% more books by the rest of the 12 laboratories not responded, comes to approximate 4 lakh books. Normally DRDO libraries purchase only one copy of each title, but in a special case second or third copy is purchased. Again it is possible that some of the fundamental subject titles may be available in more laboratory libraries,

Table 1

Collection

Name of Laboratory	Books	Report Paper	Curr/Per. Per.	Bound	St./Sp	Microdoc.	CD-ROM	Video Audio Cass.	Repr.	Sp. Coll
VRDE Ahmednagar	7630	1978	47	500	6431	Nil	Nil	Nil	Nil	Nil
DARL Haldwani	2149	20	39	Nil	Nil	Nil	Nil	30	Nil	Nil
DRL Assam	1992	60	50	3500	337	Nil	Nil	Nil	570	Nil
DEBEL Bangalore	2935	535	36	2025	625	Nil	Nil	Nil	Nil	Nil
LRDE Bangalore	13450	9260	194	5000	1300	25	Nil	128 V/C	Nil	Nil
GTRE Bangalore	6812	10770	131	4572	2745	748	Nil	Nil	Nil	Nil
NCML Bombay	4950	200	75	5000	3000	Nil	Nil	Nil	Nil	Nil
TBRL Chandigarh	4692	6902	74	3900	1088	86	Nil	Nil	Nil	Nil
DEAL Dehradun	10000	3500	225	15000	2500	54	Nil	200	45	Nil

contd.

table 1 (contn.)

Name of Laboratory	Books	Report Paper	Curr/Per. Per.	Bound	St./Sp	Microdoc.	CD-ROM	Video Audio Cass.	Repr.	Sp. Coll
DESIDOC Delhi	58000	28000	400	35000	14th	3000	14	350 V 40 A	Nil	ALTA SES, GLOB ES
ISSA Delhi	4000	450	40	3000	Nil	Nil	Nil	Nil	Nil	Nil
SAG Delhi	5000	Nil	38	300	Nil	Nil	Nil	Nil	Nil	Nil
SSPL Delhi	9400	800	41	3000	60	Nil	Nil	1	200	Nil
INMAS Delhi	7340	100	85	10000	Nil	150	1	Nil	150	Nil
DIPAS Delhi	7500	5400	78	12500	120	75	Nil	Nil	450	Nil
DRDE Gwalior	5523	214	101	1037	358	355	Nil	25	3299	Nil
RCI Hyderabad	7900	600	84	Nil	500	1 Lakh	Nil	1	Nil	Nil
DRDL Hyderabad	20500	15500	173	5000	6000	3000	4	20	Nil	Nil
DMRL Hyderabad	16900	2456	119	8000	Nil	50	2	Nil	Nil	Nil
DLRL Hyderabad	17000	6000	300	9000	4600	500	3	4	5000	3400 Trad Cat
DL Jodhpur	13200	325	118	4895	200	350	Nil	Nil	Nil	Nil
DMSRDE Kanpur	18484	387	92	16372	2883	Nil	Nil	Nil	Nil	Nil
DITM Mussoorie	10049	1125	38	724	Nil	Nil	Nil	Nil	Nil	Nil
ARDE Pune	16000	13000	120	3200	10TH	2000	NTIS 1980-94	3 V/C	Nil	Nil
RDE (E) Pune	13567	12000	130	Nil	Nil	Nil	Nil	67 V/C	Nil	Nil
ERDL Pune	6336	9495	77	3270	3621	Nil	Nil	Nil	2970	Nil

contd.

table 1 (contn.)

Name of Laboratory	Books	Report Paper	Curr/Per. Per.	Bound	St./Sp	Microdoc.	CD-ROM	Video Audio Cass.	Repr.	Sp. Coll
IAT Pune	40000	16000	300	20000	2500	3000	Nil	Nil	1000	Nil
NSTL Visakhapatnam	7000	2000	130	5000	4000	NIL	Nil	Nil	1000	Nil

CURR	CURRENT	CASS.	CASSETTES
PER	PERIODICALS	REPR.	REPRINTS
ST.	STANDARDS	SP.	SPECIAL
SP.	SPECIFICATIONS	COLL	COLLECTION
DOC	DOCUMENTS	V/C	VIDEO CASSETTES

thereby reducing collection to 3/4th. It can be thus concluded that DRDO libraries are having 3 lakh titles in the libraries of DRDO family.

Strength of reports collection is 1,47,175 in 28 libraries that have responded, which after adding 20%-25% more for non-responding ones comes to approximately 2 lakh reports. Similarly current periodicals subscribed by DRDO libraries comes to approximately 4 thousand titles (details about periodicals is discussed in table 2). Bound volume periodicals collection of 28 libraries is 1,73,795. Among 12 libraries that have not responded, the proportionate increase taken together may amount to total DRDO bound volume collection as 2.25 lakhs approximately.

Standards/specifications are an essential part of library collection dealing with mechanical design and fabrication work. Hence, libraries having less than one thousand standards can be assumed as libraries having almost nil standard collection. Fourteen libraries having a rich standard collection are LRDE, GTRE, NCML, TBRL, DEAL, VRDE, DESIDOC, DRDL, DLRL, DMSRDE, ARDE, ERDL, RDE and NSTL. These amount to 50% of libraries responded holding almost 70 thousand standards in their collection.

Microdocuments are available in 15 libraries among the 28 responded, which is almost 50% libraries. These 50% libraries are having rich collection of microdocuments amounting to 1.2 lakh microdocuments.

CD-ROM collection is available in 6 libraries only out of 28 responded. These libraries are DESIDOC, INMAS, DRDL, DMRL, DLRL and ARDE. Video cassettes/audio cassettes are available in 9 libraries i.e. 32% of 28 responded. Similarly special collection like trade catalogues, reprints, photocopies, online search copies etc. are kept by 9 libraries.

Therefore, it is concluded from table 1 that a DRDO library individually may not be having enough collection but DRDO library family as a whole has substantial collection, which is 4 lakh books, 4 thousand current periodicals, 2.25 lakh bound volumes of periodicals, 2 lakh reports, 70 thousand standards, 1.2 lakh microdocuments in addition to audio/video cassettes and CD-ROM collection.

Current Periodicals

Periodicals are backbone of any R&D library. This is the reason that R&D libraries are normally spending 65% to 80% of library budget on current periodicals. Table 2 reveals that 28 libraries are subscribing 2582 foreign periodicals and 788 Indian periodicals. Among these 31 are indexing periodicals and 28 abstracting periodicals besides CD-ROM databases.

Looking into the above fact it is evident that DRDO libraries individually may not be having big resource of periodical literature but DRDO as a whole is having giant resources of indexing, abstracting and primary foreign periodicals. On the front of Indian scientific & technological periodicals also almost all Indian periodical literature is subscribed in DRDO libraries.

Table 2 shows the periodicals holding of 28 libraries only. Presuming conservatively 20% more journals in 12 libraries who had not responsed, the approximate number of foreign periodicals is likely to be almost three thousand with one thousand Indian periodicals in current subscription list of DRDO libraries. DRDO libraries having a total of four thousand periodicals in their house

Table 2

Current Periodicals

Name of Laboratory	Indian	Foreign	Primary	Index.	Abst.
VRDE Ahmednagar	31	16	16	Nil	Nil
DARL Haldwani	35	4	4	Nil	Nil
DRL Assam	34	16	NS	NS	NS
DEBEL Bangalore	12	24	24	Nil	Ni
LRDE Bangalore	44	150	194	Nil	Nil
GTRE Bangalore	14	117	NS	NS	NS
NCML Bombay	36	39	73	Nil	02
TBRL Chandigarh	33	41	NS	NS	NS
DEAL, Dehradun	30	195	194	Nil	01
DESIDOC Delhi	50	380	350	20	10
ISSA Delhi	10	30	28	02	Nil
SAG Delhi	8	30	30	Nil	Nil
SSPL Delhi	9	32	32	Nil	Nil
INMAS Delhi	15	70	65	02	03
DIPAS Delhi	12	66	66	Nil	Nil
DRDE Gwalior	31	70	64	02	04
RCI Hyderabad	5	79	79	NS	NS
DRDL Hyderabad	11	169	167	2	2
DMRL Hyderabad	38	81	NS	NS	NS
DLRL Hyderabad	NS	300	298	2	NS
DL Jodhpur	48	70	67	01	02
DMSRDE Kanpur	24	68	66	Nil	02

contd.

table 2 (contn.)

Name of Laboratory	Indian	Foreign	Primary	Index.	Abst.
DITM Mussoorie	13	25	25	Nil	Nil
ARDE Pune	40	80	NS	NS	NS
RDE (E) Pune	70	60	60	Nil	Nil
ERDL Pune	NS	77	NS	NS	NS
IAT Pune	60	240	240	Nil	Nil
NSTL Visakhapatn	25	105	128	Nil	2

NS - Note specified INDEX - INDEXING PERIODICALS ABST. - ABSTRACTING PERIODICALS

can provide excellent resource sharing among themselves.

Manpower

While the role of documents, equipment and technology cannot be underestimated, one fact remains unquestioned that the most effective service of any library is dependent on those who have to run it. It must be kept in mind that when we have to man the libraries we need two categories of persons, the professionals and the non-professionals. The later also have a role in the overall functioning of the libraries.

In DRDO, library staff is given scientific designations and promotional avenues at par with other scientific disciplines like Physics, Chemistry, Engineering etc.

Table 3 reflects that two libraries of DRDO are running with one staff/officer posted in the library. These two libraries are DARL and DRL. DARL is running with only one person without library science qualifications. DRL in this comparison can be said to be better than DARL in the respect that it is managed by a library science professional. DRL management's not providing more manpower to library is a sad state of affair.

It is further observed that out of 28 libraries that have responded, 10 i.e. 35% are not having a single library trained gazetted officer in the library to manage the department, not even in JSO Cadre

Table 3

Manpower

Name of Laboratory	Total Manp.	Prof. Manp.	Desig.	Qual.& Exp.	Non-Prof. Manp.	Qual. & Exp.
VRDE Ahmednagar	5	3	SSA, JSA	B.Sc.+ B.Lib. 17.6.3	2	B.Com 10 Y

contd.

table 3 (contn.)

Name of Laboratory	Total Manp.	Prof. Manp.	Desig.	Qual.& Exp.	Non-Prof. Manp.	Qual. & Exp.
DARL Haldwani	1	Nil	Nil	Nil	1	M.Sc. 5 Y
DRL Assam	1	1	JSO	B.Sc.+ B.Lib 25 Y	Nil	NA
DEBEL Bangalore	2	2	SSA	B.Sc.+ B.Lib 20 Y 10 Y	Nil	NA
LRDE Bangalore	7	NIL	NA	NA	7	B.Sc 8-34 Y
GTRE Bangalore	10	9	Sc C2 JSO 1 SSA 6	M.Sc+B Lib+ADIS 2 B.Sc+B Lib-7 4-28 Y	1	B.Sc 7 Y
NCML Bombay	3	2	JSO 1 SSA 1	B.Sc.+ B.LiB 20.14 yrs	1	JSO B.Sc 30 Y
TBRL Chandigarh	7	1	JSO	B.Sc & B.Lib 21 yrs	6 1 1 2 1 1	Sc C M.Sc Ph.D. Dip & 3 yrs Matric +10 yrs Middle+13 y Graduate +3y
DEAL Dehradun	4	3	SSA	B.Sc+ B.Lib 14.14. 10 yrs	1 SSA	B.Sc+ B.Lib 10 yrs
DESIDOC Delhi	37	25	Sc C3 Sc B3 JSO 3 SSA10 JSA 5 Lib 1	M.Sc.+ M.Lib & B.Sc+ B.Lib.	12	NA
ISSA Delhi	3	2	JSO 2	B.Sc.+ B.Lib. 20,28 Yr	Sc E1	M.Sc 1 Yr.
SAG Delhi	3	2	SSA 2	B.Sc.+ B.Lib 11,11 Yr.	Sc C1	B.Sc 2 Yr.

contd.

table 3 (contn.)

Name of Laboratory	Total Manp.	Prof. Manp.	Desig.	Qual.& Exp.	Non-Prof. Manp.	Qual. & Exp.
SSPL Delhi	7	3	Sc D1 Sc B1 JSA 1	B.Sc.+ B.Lib 30,20 Y M.Sc.+ M.Lib. 4 Yrs	SSA 2 UDC 1 Att1	B.Sc+ 14 Y MATRIC+14 Y Inter 20 Y
INMAS Delhi	5	3	Sc B2 JSA-2	B.Sc+B Lib/INSDOC 5-29 Y	2	MATRIC 1-15 Y
DIPAS Delhi	4	1	Sc B1	M.Sc+ INSDOC ASSOC 12 Yr	Sc E1 JSA Att.	M.Sc 15 Yr B.Sc 4 Yr. 2 Yr.
DRDE Gwalior	6	4	Sc C1 JSO 1 SSA 1 JSA 1	M.Sc+B Lib 2 16-20Y B.Sc+B Lib 2 2-20 Y	2	High Sec 10 Y
RCI Hyderabad	POSTSANC16 POST V 11	5	Sc D1 Sc B1 SSA 1 JSA 2	M.Sc+M Lib 2 B.Sc+B Lib	NIL	NA
DRDL Hyderabad	7	7	Sc E1 Sc C1 Sc B1 JSO 2 SSA 2	M.Sc/B Sc.+ M.Lib/ B.Lib 13,30Y	NIL	NA
DMRL Hyderabad	7	7	Sc D1 Sc C1 SSA 4 Librl	M.Sc/B Sc.+ M.Lib/ B.Lib 8-17 Y	NIL	NA
DLRL Hyderabad	10	9	Sc C1 Sc B1 JSO 1 SSA 5 JSA 1		1	Sc D B.Sc 32 Y
DL Jodhpur	10	5	Sc C1 JSA 4	M.Sc.+ M.Lib BA/BSc +BLib 4-27Y	5	B.Sc +SSC 7-30yrs
DMSRDE Kanpur	12	2	SSA 1 JSA 1	B.Sc+B Lib/M. Lib 11-21Y	10	Middle to Ph.D. 1-12Y

contd.

table 3 (contn.)

Name of Laboratory	Total Manp.	Prof. Manp.	Desig.	Qual.& Exp.	Non-Prof. Manp.	Qual. & Exp.
DITM MUSSOORIE	2	2	SSA 1 JSA 1	M.A.+B Lib 7-13 Y	Nil	NA
ARDE Pune	16	8	SSA 3 JSA 5	B.Sc+ B.Lib/M.Lib 12,10,7 Yrs	8 LDC 1 UDC 1 BINDER XEROX OPERAT ORDLY -4	NS
RDE(E) Pune	3	2	SSA 1 JSA 1	M Sc+M Lib 19 Y B Sc+B Lib 7 Y	1	SSC 17 Y
ERDL Pune	8	7	Sc B1 SSA 3 JSA 3	B.Sc.+ B.Lib 24-5 Y	1	JSA M.Sc 9 Y
IAT Pune	14 POSTSSAN 10 VACAN	4	Sc F1 Sc C1 Sc B1 SSA 1	Ph.D Lib Sc M.Sc/B Sc+B Lib/M Lib 9-18 Y	1	B.Sc 22 Y
NSTL Vishakhapatnam	4	4	Sc B1 SSA 2 JSA 1	M.Sc.+ M.Lib/B.Lib. 20.10.3,3		

MANP. - MANPOWER
DESIG. - DESIGNATION
QUAL. - QUALIFICATIONS
PROF. - PROFESSIONAL
Sc. - SCIENTIST

JSO - JUNIOR SCIENTIFIC OFFICER
JSA - JUNIOR SCIENTIFIC ASSISTANT
SSA - SENIOR SCIENTIFIC ASSISTANT
EXP. - EXPERIENCE

(JSO is class II gazetted post in DRDO and scientific assistant recruited in the JSA II scale of Rs. 1320-2050, are getting promotion through DPC in almost 20 years). These libraries are VRDE, DARL, DEBEL, LRDE, DEAL, SAG, DMSRDE, DITM, ARDE and RDE.

There are 4 libraries managed by senior library officers who are library science discipline JSO. These libraries are DRL, NCML, ISSA and TBRL. JSO is the junior most officer cadre in DRDO laboratories. Therefore, while framing policies for libraries, their voice either does not reach or is not properly put up before higher management which provides sanction to library equipment and manpower.

Therefore, out of 28 laboratories responded, 14 libraries i.e. 50% libraries do not have proper library managers. Naturally, these library and information managers may not be having adequate authority to impress upon the relatively senior ones enjoying controlling power.

Table 4

Computer Hardware and Software

Name of Laboratory	Nameof Machine & Hard Disc	Operating System	RAM Memory	Softwares used	Environment (OS)
VRDE Ahmednagar	NA	NA	NA	NA	NA
DARL Haldwani	NA	NA	NA	NA	NA
DRL Assam	NA	NA	NA	NA	NA
DEBEL Bangalore	NA	NA	NA	NA	NA
LRDE Bangalore	PC-XTs 80 MB PC-ATs 80 MB	DOS - 4	1 MB	DATARETRIEVE DBASE III+	DOS DOS
GTRE Bangalore	PC-AT286 40 MB HCL Workhorse 20 MB	DOS CP/M	1MB 1MB	DBASE DIALOG CDS/ISIS	CP/M DOS DOS
NCML Bombay	NA	NA	NA	NA	NA
TBRL Chandigarh	PC-XT HD 20 MB	DOS (5.0)	640 KB	CDS/ISIS	DOS
DEAL Dehradun	ESPL 40 MB	DOS	1 MB	DELMS DBASE CDS/ISIS WORDSTAR	DOS DOS DOS DOS
DESIDOC Delhi	486 (2) 386 (24) 286 (22) XT (14)	UNIX DOS	NS NS NS NS	DELMS DBASE INGRES ORACLE	DOS DOS NS NS
ISSA Delhi	PC-XT HD-NS	DOS	640 KB	CDS/ISIS DELMS	DOS DOS
SAG Delhi	NA	NA	NA	NA	NA
SSPL Delhi	PC-386 200 MB PC-286 80 MB	DOS DOS	4 MB 1 MB	DELMS	DOS
INMAS Delhi	NA	NA	NA	NA	NA
DIPAS Delhi	NA	NA	NA	NA	NA

contd.

table 4 (contn.)

Nameof Laboratory	Nameof Machine & Hard Disc	Operating System	RAM Memory	Softwares used	Environment (OS)
DRDE Gwalior	PC-XT 20 MB CROMPT GR 80 MB	DOS DOS	640 KB 1.5 MB	WORDSTAR DBASE CDS/ISIS	DOS DOS DOS
RCI Hyderabad	NS	NS	NS	ILIS	NS
DRDL Hyderabad	MEDHA- 930 14 4.5 GB	NS	NS	ILIS	NS
DMRL Hyderabad	DCM PS 386/33C 300 MB DCM PS 386/SX 170 MB	UNIX DOS	8 MB 1 MB	LIBSYS DBASE III+ FOX+ PROCOM	UNIX DOS DOS DOS
DL Jodhpur	PC-386 80 MB PC-286 80 MB PC-XT 40 MB PC 40 MB	DOS DOS DOS DOS	1 MB 1 MB 640 KB	DELMS LIBMAN WORDSTAR WORDPERFECT	DOS DOS DOS DOS
DMSRDE Kanpur	PC-AT 286 80MB	DOS	1 MB	DBASE WORDSTAR WINDOWS 3.1 CDS/ISIS	DOS DOS DOS DOS
DITM Mussoorie	NA	NA	NA	NA	NA
ARDE Pune	ND-570 450 MB PC-286(2) 80 MB PC-486(1) 200 MB	SINTRAN DOS DOS/UNIX	16 MB 1 MB 4 MB	COBOL	SINTRAN DOS CDS/ISIS
RDE(E) Pune	PC-AT 286 40 MB PC	DOS DOS(LAN)	2 MB	DBASE III+	DOS
ERDL Pune	PC-AT 286 200 MB	DOS	1 MB	CDS/ISIS	DOS
IAT Pune	PC 80 MB PC 40 MB	DOS DOS	NS NS	CDS/ISIS	DOS
NSTL Visakhapatnam	SNPC 10 MB PC-XT 10 MB PC-XT 20 MB	DOS DOS DOS	640 KB 640 KB 640 KB	NS	NS

NA - NOT AVAILABLE/NIL
NS - NOT SPECIFIED

Ratio of professional (P) and non professional manpower (NP) in some of the laboratories indicates that non-professional manpower ratio is towards higher side. These laboratories are LRDE-OP/7NP, TBRL-1P/6NP, DIPAS-1P/3NP, DMSRDE-2P/10 NP.

Therefore, the above given ratio of professional and non-professional people posted in the libraries is quite imbalanced. It is ideal if ratio of professional to non-professional is 3:1 but upto 1:1 can be treated as satisfactory.

It is concluded from table 3 that 50% of DRDO libraries are not having proper library officers/ managers for information management work. Therefore, these 50% need immediate placement of people as scientist "B" with library Science qualifications to have an effective information management in DRDO libraries. Some of the libraries where proportion of non-professional staff posted in the library is less than 50%, only professionally qualified persons be recruited and should be posted in these libraries in future.

Computer Hardware and Software

Our development plans and national goals can be effectively carried out only if our information infrastructure is sound and we are suitably geared for the purpose. At a time when we are on the threshold of 21st century, it is all the more necessary that the information grid of the DRDO is modernised and strengthened. In the recent past, computers have made their presence felt on the Indian scene and an awareness is being created to make use of them for various information needs in our country.

It is observed that out of 28 libraries responded, 9 libraries (approximately 34%) do not have computer hardware. These libraries are VRDE, DARL, DRL, DEBEL, NCML, SAG, INMAS, DIPAS and DITM. Of these, SAG, DIPAS, INMAS are located in New Delhi, DEBEL and NCML are located in Bangalore and Bombay respectively. In these cities (Delhi, Bombay, Bangalore) hardware suppliers are available on phone call and system can be installed on the same day. Even then library staff is not putting proper case to the authorities for purchase of computer hardware. VRDE, DRL, DITM, DARL are located in remote places but still it is high time for them to initiate proper case of hardware.

Of the 19 libraries having computer hardware it is observed that five libraries i.e. TBRL, ISSA, DRDE, IAT and NSTL are having PC-XT only. PC-XT are outdated in the context of database management activities. PC/PC-XT can be used as a learner instrument, inputting of data and word processing. Therefore, these 9 libraries without any hardware and 4 with PC-XT grouping together forming 43% libraries come under the category of without proper computer hardware.

In terms of system configuration, operating systems, RAM and hard disk capacity, table 4 reveals that only 12 libraries i.e. ARDE, DRDL, DMRL, DRDL, RCI, SSPL, LRDE, GTRE, DL, RDE, ERDL and DESIDOC i.e. 43% are having adequate hardware structure to operate effectively the library and information management work.

Computer Software

Software, the set of instructions that tell a computer what to do, is becoming more important than the computer itself. The booming software industry is, therefore, setting the pace of information technology revolution - and the pace is frantic.

Table 4 reflects that out of 28 libraries responded, 9 libraries (approx. 34%) do not have computer hardware, therefore, the table accordingly points out that software activity will not be applicable on them. Among 19 libraries having computer systems, NSTL has not specified the software details with them. This reflects that they are undecided on software to be implemented in their library.

Table 4 further reveals that out of 19 DRDO libraries having some software/package, 10 are using CDS/ ISIS for their database activity. These libraries are GTRE, TBRL, DEAL, ISSA, DRDE, DMSRDE, DMRL, ARDE, ERDL and IAT. Foxpro and Dbase are established database management packages and 9 libraries have developed inhouse packages for their library and information work. These laboratories are LRDE, GTRE, DEAL, DESIDOC, DRDE, DLRL, DMSRDE, DL AND RDE. It is worthwhile to note that three libraries DEAL, DRDE AND DMSRDE are using CDS/ISIS and DBASE both packages.

Therefore, these libraries are using CDS/ISIS for some functions and DBASE for rest of library activities.

There are five libraries (DESIDOC, ISSA, SSPL, DEAL and DL) using DELMS package developed by DESIDOC in COBOL language. This package incorporates all library functions and it is given to all DRDO libraries on complementary basis if they wish to adopt this package in their library work. Thus if only 5 libraries, i.e. 25% are implementing this package, it indicates that there are some problems in implementing this package. RCI and DRDL are working in ILIS while DMRL although in the same city is executing their library work through LIBSYS, a commercially developed library package.

Hence, it is advisable that each library should have minimum facilities like a PC-486 or preferably pentium with 16 MB RAM and 1 GB hard disk capacity system in the library to operate library management work effectively.

DRDO libraries are building their databases through a variety of software packages developed by their laboratories/DESIDOC/NISSAT/commercial vendors. Databases developed in a variety of softwares leads to hetrogenity of data and it creates problems in networking. Therefore, it is desirable that a common software is to be decided upon looking into all future implications and a copy of this software is to distributed to all DRDO Libraries/TICs with interface programmes to convert their databases into designated DRDO library software.

Implementation of Software

Circulation, acquisition, catalogues, serials management, current awareness services (CAS) and selective dissemination of information (SDI) are important and inescapable activities for any library and technical information centre.

Circulation

Automation of circulation is easily handled if database activity is updated and circulation being a by-product of database activity will help in generating reminders, reports and statistics.

It is observed by examining table 4 that only 10 out of 19 libraries had adopted for automation i.e. only 50% of library softwares are capable of automating circulation control of library. These 10 laboratory libraries are LRDE, GTRE, DESIDOC, RCI, DRDL, DMRL, DLRL, DL, ARDE, and RDE. Among libraries that have automated their circulation system, 9 belong to metropolitan cities like Hyderabad, Bangalore, Pune, and Delhi. DL Jodhpur is the only library located in a non-metropolitan city.

Acquisition

This area of activity is normally treated as indoor activity of a library but it is very important for library managers to know financial status at any time. Automating acquisition reduces 50% typing load and library staff can devote more time to information activities. Eight laboratory libraries i.e. 42% of the automated libraries are managing their acquisition work through library packages. These laboratory libraries are LRDE, DESIDOC, DRDE, DRDL, DMRL, DL, ERDL, AND RDE.

Catalogue

The term catalogue includes database of books, reports, standards, reports etc. Databases created indirectly provide catalogue cards as by-product output provided package is developed after study of library procedures/consultation of library professionals. It is observed from table 5 that 15 laboratory libraries are generating their catalogue cards through packages. Therefore, 75% of libraries opting for automation are able to utilize automation effectively. Four laboratory libraries (NSTL, ERDL, TBRL, GRTE) opting for automation are perhaps in the beginning stage of database building and they may utilize their databases for catalogue card generation after sometime.

Serials

Serials/periodicals are backbone of any R&D organisation. Therefore, automated serials management gives quickest information access to scientists of laboratory even in the absence of library staff. Out of 19 laboratory libraries adopting automation, only 9 i.e. approx 50% have moved towards serials automation. These laboratory libraries are LRDE, DEAL, DESIDOC, ISSA, DRDL, DMRL, DL, RDE, and ERDL.

Serials management is a must for any automated library management. Therefore, the rest of 10 laboratory libraries should automate their serials control immediately to build effective node to participate in proposed DRDO network.

Table 5

Computer: Implementation of Software

Name of Laboratory	CIR.	ACQ.	CAT.	SER.	CAS	SDI	OTH.
VRDE Ahmednagar	NA	NA	NA	NA	NA	NA	NA
DARL Haldwani	NA	NA	NA	NA	NA	NA	NA
DRL Assam	NA	NA	NA	NA	NA	NA	NA
DEBEL Bangalore	NA	NA	NA	NA	NA	NA	NA
LRDE Bangalore	Y	Y	Y	Y	Y	Y	NS
GTRE Bangalore	Y	N	N	N	Y	N	NS
NCML Bombay	NA	NA	NA	NA	NA	NA	NA
TBRL Chandigarh	N	N	N	N	N	N	N
DEAL Dehradun	N	N	Y	Y	N	N	N
DESIDOC Delhi	Y	Y	Y	Y	Y	Y	Y
ISSA Delhi	N	N	Y	Y	Y	Y	N
SAG Delhi	NA	NA	NA	NA	NA	NA	NA
SSPL Delhi	N	N	Y	N	N	N	N
INMAS Delhi	NA	NA	NA	NA	NA	NA	NA
DIPAS Delhi	NA	NA	NA	NA	NA	NA	NA
DRDE Gwalior	N	Y	Y	N	N	N	NS
RCI Hyderabad	Y	N	Y	N	N	N	NS
DRDL Hyderabad	Y	Y	Y	Y	Y	Y	NS
DMRL Hyderabad	Y	Y	Y	Y	Y	Y	NS
DLRL Hyderabad	Y	N	Y	N	Y	N	NS
DL Jodhpur	Y	Y	Y	Y	Y	Y	Full Corre sp/ Register
DMSRDE Kanpur	N	N	Y	N	N	N	NS
DITM Mussoorie	NA	NA	NA	NA	NA	NA	NA
ARDE Pune	Y	N	Y	N	Y	N	N

contd.

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table 5 (contn.)

Name of Laboratory	CIR.	ACQ.	CAT.	SER.	CAS	SDI	OTH.
RDE(E) Pune	Y	Y	Y	Y	N	N	N
ERDL Pune	N	Y	N	Y	Y	Y	N
IAT Pune	N	N	Y	N	Y	Y	N
NSTL Visakhapatnam	N	N	N	N	Y	N	N

CIR - CIRCULATION
ACQ. - ACQUISITION
CAT. - CATALOGUING
SER. - SERIALS
CAS - CURRENT AWARENESS SERVICE
SDI - SELECTIVE DISSEMINATION OF INFORMATION
OTH. - OTHERS
NA - NOT AVAILABLE/NOT MENTIONED
NS - NOT SPECIFIED

Current Awareness Services

This service includes list of current arrivals & bibliographies etc. It is possible provided printed output facilities are in-built in library packages adopted by the library concerned. Out of 19 laboratory libraries that moved towards automation, 12, i.e. 63% are providing X or Y forms of current awareness services.

Selective Dissemination of Information Services

This is highly specialized personalized information service lending pride to any library but in DRDO setup only 8 i.e. 42% libraries/TICs are providing SDI Services to their scientists.

In the field of SDI services, DESIDOC is leader in DRDO and they are providing SDI services not only to Delhi region (North Region) laboratory scientists but also to the scientists of all the other 46 DRDO laboratories provided SDI feedback is given to them regularly.

Among 28 laboratory libraries responded to questionnaire, 19 i.e. 66% have gone for library automation. Out of these 66% i.e. only five laboratories have moved towards 100% automation of library and information work. These libraries are LRDE, DESIDOC, DRDL, DMRL and DL. However among 19 that have opted for automation activity, percentage for various activities stands as: circulation 50%, acquisition 42%, catalogue 75%, serials 50%, current awareness services 63% and SDI services 42%.

Computer Database Depth

Data is defined as the raw material which is an input to the information system. Information is defined as the finished goods in the process. Database is defined by James Martin, a leading authority, as "a collection of data that is shared and used for multiple purposes".

The DRDO needs a database that is purposeful and meaningful to the users. Database implies that items of relevance must be stored in order to meet information processing and retrieval needs of an organization. The term implies an integrated file of data used by many processing applications in contrast to an individual data file for each separate application. The key element in database concept is that each subsystem utilizes the same database in satisfying its information needs. Duplicate files or subsets of the database are avoided.

In the context of DRDO database it is implied that DRDO databases of laboratory library are confined to only published and freely available material i.e. holdings of books, periodicals, standards reports

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Table 6

Computer Database Depth

Name of Laboratory	Comput. services	Contents & size of database	Input Format	Interfac.cap
VRDE Ahmednagar	NA	NA	NA	NA
DARL Haldwani	NA	NA	NA	NA
DRL Assam	NA	NA	NA	NA
DEBEL Bangalore	NA	NA	NA	NA
LRDE Bangalore	Search: AUTHOR. TITLE.SUB.ACC. NO. ABS SEARCH	40.000 ABSTRACTS 22710 BOOKS+R	CCF	Nil
GTRE Bangalore	CAS Serv. SDI Serv.	500 Records	CCF	NS
NCML Bombay	NA	NA	NA	NA
TBRL Chandigarh	Nil	Nil	CCF	Nil
DEAL Dehradun	Nil	NS	CCF	1.N 2.Y 3.N
DESIDOC Delhi	SEARCH	NS	CCF	1.Y 2.Y 3.Y
ISSA Delhi	SEARCH	NS	CCF	1.N 2.N 3.N
SAG Delhi	NA	NA	NA	NA
SSPL Delhi	SEARCH: CATALOGUE	NS	CCF	1.Y 2.N 3.Y
INMAS Delhi	NA	NA	NA	NA
DIPAS Delhi	NA	NA	NA	NA
DRDE Gwalior	NS	2369 KB B & R 1292 KB Microform Trans, Photocopy 95 KB GR/ REPRINTS	INTERNAL Designed	NIL
RCI Hyderabad	NS	NS	CCF	NS
DRDL Hyderabad	ILIS	40000 Records	CCF	NS

contd.

table 6 (contn.)

Nameof Laboratory	Comput. services	Contents& size of database	InputFormat	Interfac.cap
DMRL Hyderabad	ON LINE CAT. OF B+R+Pr. Sel.Per.ASDI. CAS.List of Add.	20500 B 59600 Sel Per.Art. 1500 DMRL Pub.Rec.	CCF	Y EXCEPT Word Process.
DLRL Hyderabad	CIRCUL.	14000 Records	CCF COMPATIBLE	1. N 2. NS 3. Y
DL Jodhpur	ON LINE CAT. OF B+R+Pr. Bound Per.Curr.Per1 991.94, CAS. List of Add, Bibliography	10000 Book+Rep+ STANDARDS 4800 Bound Per. 7000 issues of Curr.Per. 2000 Circul Records 1000 Aquisition	CCF	Y(ERNET)
DMSRDE Kanpur	Nil	8600 Books	CCF	1. N 2. N 3. N
DITM Mussoorie	NA	NA	NA	NA
ARDE Pune	ON LINE CATALOG. CIRCULATION	20 MB B 6 MB REP 1 MB SPE	Internally Designed	1. N 2. N 3. N
RDE (E) Pune	ON LINE CATALOG	13500 B 12000 DR 67 V/C 1000 Down Loaded Rec 1000 Rep	Internally Designed	1. Y 2. Y 3. Y
ERDL Pune	Nil	5000 Books	CCF	1. N 2. N 3. N
IAT Pune	ON LINE CATALOG. CAS.SDI	BOOKS. BIND.PER., MICROFICHEREP. ABST., REPRINTS, THESES	Internally Designed	1. Y 2. Y 3. Y
NSTL Visakhapatnam	NS	NS	Internally Designed	1. N 2. Y 3. N

COMPUT. - COMPUTERISED
NA - NOT AVAILABLE/NOT MENTIONED
CIRCUL. - CIRCULATION
PERD. - PERIODICALS
CAT. - CATALOGUING
INTERFAC. - INTERFACING
CAP. - CAPABILITIES
ADD. - ADDITIONS
PER. - PERIODICALS
SDI. - SELECTIVE DISSEMINATION OF INFORMATION
SPE. - SPECIFICATIONS
B. - BOOKS
DR. - DRAWING
V/C - VIDEO CASSETTES
REC. - RECORDS
R - REPORTS
PR. - PROCEEDINGS
CAS - CURRENT AWARENESS SERVICE
TRANS. - TRANSLATION

and all other kinds like microforms, CDs and audio visual materials existing in the library/TICs of laboratory.

Computer database depth can be measured by input format, contents and size of database, interfacing capabilities and computerised services offered to users (Table 6).

Input Format

Among 19 laboratory libraries, 13 i.e. 68% have choosen CCF format/data entry element in their software. Six libraries only designed their own format but most of the data entry element may be common to CCF. This is very pertinent point for compatibility in networking.

CCF and MARC are the two internationally accepted formats for bibliographic input of records. CCF can be converted to MARC but vice versa is not possible. Thus, input format of DRDO libraries are moving in the right direction.

Contents and Size of Database

It reflects the extent of computerization in the library concerned. Table 6 reveals that out of 19 libraries only 12 had specified the records present in their database. Therefore, 33% libraries among the automated ones are in the begining stage. In two libraries i.e. DRDE and GTRE the database record number is less than thousand. Libraries having more than 10 thousand records in their database are only 9 i.e. approx 50% of automated libraries. These libraries are LRDE, DRDL, DLRL, DMRL, DL, DESIDOC, ARDE, RDE and IAT.

Interfacing Capabilities

All standard software can be interfaced with communication software package and word processing software packages. Table 6 reveals that only 6 laboratory libraries software packages have interfacing capabilities. These laboratory libraries are DESIDOC, SSPL, DMRL, DL, IAT and RDE. Rest of the library packages do not have interfacing capabilities. Therefore, these software packages need upgradation for sharing their database by other laboratory libraries.

Computerised Services

Service is ultimate destination of all database activity. It is observed from table 6 that till now only 13 laboratory libraries are providing one or the other computerised services to their users; rest 6 are still in infancy stage only.

It is imperative from table 6 that DRDO libraries database activity needs more standardisation so that individual database can be used more effectively and dreams of DRDO database prove a reality.

Computer Networking

All laboratories of DRDO are having E-mail and internet access either through RENNIC or ERNET. Some of them have both also particularly in Metro city based laboratories. Thus, all libraries of DRDO are participating in network activities. DESIDOC is a major partner in DELNET, in addition to ERNET. Downloading facility is available to ERNET participants but library managers of some laboratories are not aware/not using this facility. Therefore, they did not provide any information on this aspect even though they are participating in ERNET.

Sharing of DRDO database and other modalities in DRDO are now in the finalization stage. A committee has been constituted to finalize the networking software for DRDO libraries.

Proposal for DRDO libraries network has been discussed at the meetings of Heads of Libraries/ TICs of DRDO, held on 29-30 Sept, 1993 at DESIDOC and it was decided to form four regional centres viz, Hyderabad, Pune, Bangalore and Delhi and DRDO NETWORK will operate in distributed database network mode.

CONCLUSIONS/RECOMMENDATIONS

The information technology has brought together libraries and has resulted in the concept of library without walls, meaning thereby that the resources of all libraries in a network are available to the whole user community. Present study of Information management in DRDO Libraries/ Technical Information Centres (TICs) leads to the following conclusions:

1. In the present information age no library can be self sufficient. Therefore, networking of DRDO collection is essential for each DRDO library/TIC to function as a true information centre.
2. It is concluded from table 1 that DRDO libraries individually may not be having enough collection but DRDO library family as a whole has substantial collection consisting of 4 lakhs books, 4 thousand standards, 1.2 lakhs microdocuments in addition to audio/video cassettes and CD-ROM collection.
3. DRDO libraries having a resource of 3 thousand foreign and 1 thousand Indian periodicals in their collection can provide excellent resource sharing among themselves and geared with good marketing technique, resource generation can be a success.
4. It is concluded from table 3 that 50% of DRDO libraries are not having proper library officer/ manager for information management work. Therefore, these libraries need immediate placement of Scientist "B" of library science discipline to have an effective information management in DRDO libraries. Some of the libraries where proportion of non-professional staff posted in the library is less than 50%, in future only senior library science professionals be recruited.
5. Services are the product/output of recources and manpower existing in any library. DRDO libraries are providing all such services to their scientists depending on the resources, infrastructural facilities and quality of manpower existing in the respective library. Hence, it is recommended to enrich library staff in DRDO with more library professionals and provide amenities for library automation. This will result in increase in services to DRDO Scientists.
6. It is observed that out of 28 libraries responded 9 libraries (34%) do not have computer hardware. These libraries should make efforts to acquire computers and automate their libraries at the earliest. It is advised that each library should have minimum PC-486 or preferebly pentium with 16MB RAM and 1 GB hard disk capacity system in the library to carry out library management work effectively.
7. DRDO libraries are building their databases through a variety of software packages developed in their laboratories/DESIDOC/ NISSAT/ Commercial vendors. Databases in different language.softwares leads hetrogenity of data and it creates problems in networking. Therefore, it is desirable that a common software is to be selected looking into all future implications and a copy of this software be distributed to all DRDO Libraries/TICs with interface programme to convert their database into designated DRDO library software.
8. It is imperative from Table 6 that DRDO Libraries database activity needs more standardisation so that individual database can be used more effectively and dreams of DRDO database proves a reality.

Finally, it is concluded that DRDO libraries/TICs are having sufficient budget of Rs. 6 crores per year for purchase of reading materials. Collection of DRDO libraries is almost ten lakh books, bound volumes of periodicals, reports, standards and microdocuments in addition to periodicals subscription for 3 thousand foreign and one thousand Indian periodicals per year. Library automation and networking activities are at two extreme ends, high sophistication to almost primary stages. Routine library services to highly sophisticated services are provided by various DRDO libraries. Some libraries are not adopting even traditional standard library practises for acquisition, periodicals and circulation work while on the other hand there are libraries having 100% activities automated, as mentioned above.

Trained library manpower is lacking in 50% of libraries that have responded. This situation becomes more serious when libraries having science trained personnels are headed by non-library science officer-in-charge. The net result is a library not following standard practises of information management and remains in preliminary stages.

Therefore, it is recommended to provide standard computer hardware (minimum PC-486 or preferably Pentium with 16MB RAM, 1 GB Hard disk and Printer), copy of designated DRDO library software, STD telephone, Modem, CD-ROM Reader, training to existing manpower to use above gadgets, E-mail connection, trained library manpower (at least Scientist "B" and technical/scientific assistants) for all the libraries which are not having above mentioned equipment and manpower. This will lead to excellent information management in DRDO libraries/technical information centres in a few years.

The above recommendations are equally applicable to all those libraries which desire to have sound information management in their libraries like CSIR, ICAR, ICMR etc.

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Appendix-I

LIST OF DRDO LIBRARIES/TICs

1. Aerial Delivery Research & Development Establishment, (ADRDE), Agra Cantt.
2. Vehicles Research & development establishment (VRDE), Ahmednagar
3. Defence Agricultural Research Laboratory (DARL), Haldwani
4. Defence Research Laboratory (DRL) Tezpur, Assam
5. Proof & Experimental Establishment (PEE), Balasore
6. Microwave Tubes Research & Development Centre (MTRDC), Bangalore
7. Centre for Aeronautical Systems Studies & Analyses (CASSA), Bangalore
8. Centre for Artificial Intelligence and Robotics (CAIR), Bangalore
9. Defence Electro-medical & Bio-Engineering Laboratory (DEBEL), Bangalore
10. Aeronautical Development Establishment (ADE), Bangalore
11. Advanced Systems Integration & Evaluation organisation (ASIEO), Bangalore
12. Gas Turbine Research Establishment (GTRE), Bangalore
13. Electronics & Radar Development Establishment (LRDE), Bangalore
14. Naval Chemical & Metallurgical Laboratory (NCML), Bombay
15. Terminal Ballistics Research Laboratory (TBRL), Chandigarh
16. Instruments Research & Development Establishment (IRDE), Dehradun
17. Defence Electronics Application Laboratory (DEAL), Dehra Dun
18. Defence Institute of Fire Research (DIFR), Delhi
19. Defence Science Centre (DSC), Delhi
20. Institute of Systems Studies & Analyses (ISSA), Delhi
21. Solid State Physics Laboratory (SSPL), Delhi
22. Scientific Analysis Group (SAG), Delhi
23. Institute of Nuclear Medicine & Allied Sciences (INMAS), Delhi
24. Defence Terrain Research Laboratory (DTRL), Delhi
25. Defence Institute of Physiology & Allied Sciences (DIPAS), Delhi

26. Defence Research & Development Establishment (DRDE), Gwalior
27. Defence Metallurgical Research laboratory (DMRL), Hyderabad
28. Defence Electronics Research Laboratory (DLRL), Hyderabad
29. Defence Research & Development Laboratory (DRDL), Hyderabad
30. Defence Laboratory (DL), Jodhpur
31. Defence Materials & Stores Research & Development Establishment (DMSRDE), Kanpur
32. Combat Vehicle Research & Development Establishment (CVRDE), Madras
33. Snow & Avalanche Studies Establishment (SASE), Manali
34. Defence Institute of technology Management (DITM), Mussoorie
35. Defence Food Research Laboratory (DFRL), Mysore
36. Defence Institute of Psychological Research (DIPR), New Delhi
37. Institute of Armament technology (IAT), Pune
38. Research and Development Establishment (Engineers) (R & DE (E)), Pune
39. Explosives Research & Development Laboraotry (ERDL), Pune
40. Naval Science & Technology Laboratory (NSTL), Visakhapatnam
41. Interim Test Range (ITR), Balasore
42. Centre for Artificial Intelligence & Robotics (CAIR), Bangalore
43. Centre for Air Borne System (CABS), Bangalore
44. Technology Development Centre (TDC), Bangalore
45. Advanced Numerical Research & Analysis Group (ANURAG), Hyderabad
46. Field Research Laboratory (FRL), Leh

Appendix-II

QUESTIONNAIRE

INFORMATION MANAGEMENT IN DRDO (Defence Research & Development Organisation) LIBRARY/TECHNICAL INFORMATION CENTRES : A SURVEY

Being Conducted :

R.S. RATHORE
Scientist 'D'
Defence Laboratory
Jodhpur-342011

NOTE: (A) Information supplied by you will be kept confidential and will be used for research purpose only.
(B) Kindly tick mark the appropriate column, wherever applicable.
(C) If you want to make any suggestion, please do so on a separate sheet and attach the same with this schedule.

1. Name of Lab./Establishment

2. Name of the Head of the Library/TIC

3. Year of Establishment of Library/TIC

4. Postal Address of the Estt.

5. Telex ____________________ Telegram ____________________

Fax ____________________ E-mail ____________________

6. Collections as on to-date (write N.A., if not applicable).
(i) Books ____________________
(ii) Foreign ____________________
(paper copies)
(iii) Current periodicals

(A) Indian ______________
(B) Foreign ______________
Primary _ _ _ _ _ _ _
Indexing _ _ _ _ _ _ _
Abstracting _ _ _ _ _ _ _
(iv) Bound Volume of periodicals _ _ _ _ _ _
(v) Standards/Specifications _ _ _ _ _ _
(paper versions)
(vi) Microdocuments _ _ _ _ _ _
(microfilms, microfiches, etc. Pl. give details)
(vii) CD-ROM Databases _ _ _ _ _ _
(viii) Video/Audio Cassettes _ _ _ _ _ _
(ix) Special collection out of the above categories (pl. specify) _ _ _ _ _ _

7. Manpower
(Add separate sheet if necessary; attach organisational chart of Lib/TIC)

(A)

Designation	No. of Posts Sanctioned	Posts Vacant	Requisite Qualification

(B) PRESENT MANPOWER

Designation	Qualification	No. of years of experience in Lib/Information work

8. Type of Services offered (Please tick)

Inter-library Lending ( )
User Counselling ( )
Translation Services@ ( )
Current Awareness Services* ( )
Teaching/Training ( )
Consultancy ( )
Printing ( )
Reference Service ( )
CD-ROM Searching ( )
Bibliographies Services* ( )
Information Repackaging* ( )
Online Searching ( )
Research Guidance in Lib/Infor Sci ( )
Xeroxing/reprography ( )

* Attach a copy of the service/bulletin

@ Give no of pages of original text translated, year-wise.

1988	1989	1990	1991	1992	1993

9. Computerisation Activities

(i) Hardware used

Name of Machine	Operating System	Memory	Hard Disc	Capacity

(ii) Software used

Name	Environment (OS)	Date of Procurement	Cost

(iii) Implementation of Software

(a) Activity Computerised (pl. tick)

(i) Circulation ( )
(iii) Catalogue ( )
(v) CAS ( )
(viii) Others (pl. specify)
(ii) Acquisition ( )
(iv) Serials ( )
(vi) SDI ( )

(b) Computerised services offered to the users
(c) Contents and size of database as on todate
(d) input format used (such as MARC, CCF, UNIMARC/internally designed)
(e) Capabilities of the software

* Can interface with any communication software package? (Yes/No)

* Can interface with word processing software package? (Yes/No)

* Database can be searched by remote users? (Yes/No)

10. SDI Services

(i) Are you offering any SDI Services?

11. Network

(i) Do you participate in any national networks? (pl. tick)

INDONET [ ]
INFLIBNET [ ]
DELNET [ ]
PUNNET [ ]
SIRNET [ ]
Others (please specify)

NICNET [ ]
ERNET [ ]
CALIBNET [ ]
BOMNET [ ]
MALIBNET [ ]

(ii) Are you a node of any of these network? (pl. specify)
(iii) Can your database be shared by other institutions if so, on what terms?
(iv) What search software package is used? (in the Network)
(v) Is there any downloading facility available? Yes/No.

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GROWTH OF DOCTORAL DISSERTATIONS ON GROUNDNUT IN INDIA: A STUDY

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Traces early scientific reporting on groundnut and presents an analysis of compiled bibliography on Doctoral Dissertations on groundnut in India in terms of yearwise, cropwise and disciplinewise growth of doctoral dissertations during the period 1948-1996.

INTRODUCTION

Groundnut (Arachis hypogaea L.) also known as peanut is an important oilseed crop. Groundnut is believed to be the native of Brazil where it was cultivated as early as 950 B.C. Though the archeological evidence from South and Central America indicates groundnut as food crop grown in pre-columbian times, its exact origin was not recorded. Groundnut, an alien oilseed plant was introduced into India during first half of the sixteenth century from one of the pacific islands or China where it was earlier introduced from South America. Groundnut was first popularised in South India specifically in Madras Presidency between 1851-1905 by growing alien varieties. According to Achaya [1] the crop spread from Madras to Gujarat and gradually to other states of India. Thus, the commercial and industrial use of groundnut as we know it is only less than 200 year old. Within this short span of period, India occupied the pre-eminent position in world's groundnut economy. India has the largest area growing groundnut (8.3 million tonnes) and is also largest producer (7.1 million tonnes) of groundnut accounting for one third of world's production [2]. Groundnut referred to as the 'King of vegetable oilseeds' constitutes the most important source for edible oil in India. About 80% of the crop produced is utilized for oil production. Groundnut is not only used for oil extraction but is also used in a wide range of food industries. Of late, groundnut as a food crop is gaining importance.

EARLY SCIENTIFIC REPORTS ON GROUNDNUT

The written reports on groundnut date back to the sixteenth century, the era during which the crop spread to Africa and Europe. It is believed that there is no record on groundnuts in the writings by ancient Sanskrit scholars. The first report on groundnut cultivation in India was only in 1800 AD [3]. Scientific reports on groundnut cultivation and its commercial use dates back from late nineteenth century. Till India attained independence, research on groundnut was sporadic and confined only to some princely states and in some traditional universities. A number of groundnut research workers started publishing their experimental research findings in scientific journals as early as 1970 in India. Publication of articles proliferated from late fifties along with increasing number of agricultural periodicals in India. A few important journals/bulletins which published earliest scientific reports on groundnut are listed below:

Journals/Bulletins	Year
Department of Agriculture, Madras bulletin	1909
Department of Agriculture, Bombay Bulletin	1911
Imperial Institute Bulletin	1925
Times Press, Bombay	1928

contd.

Journals/Bulletins	Year
Journal of Agricultural Experimental Union	1930
Agriculture and Livestock in India	1932
Indian Journal of Agricultural Sciences	1933
Madras Agricultural Journal	1935
Current Science	1935
Journal of Bombay Natural History Review	1938
Indian Journal of Genetics and Plant Breeding	1943
Science and Culture	1946
Plant Physiology	1949
Plant Protection Bulletin	1951
Department of Economic Botany, UP Tech. Bulletin	1952
Mysore Agriculture journal	1954
Indian farming	1953
Indian Oilseeds Journal	1956

RESEARCH ON GROUNDNUT

Organised and systematic research on groundnut in India is a post independence phenomenon. Research on groundnut could be classified into two broad groups: i) Individuals carring out research in traditional universities leading to M.Sc. and Ph.D. degrees, and 2) mission oriented applied research carried out under the All India Co-ordinated Research Project on Oilseeds, ICAR. While research by individual scholars mostly confined to basic and fundamental aspects, the multi-disciplinary research on groundnut was carried out under All India Coordinated Research Project on Oilseeds at multi locations in all the groundnut growing states in India. Realizing the need for further technological support for this economically important high value cash crop, National Research Centre for Groundnut was established at Junagadh, Gujarat in 1979. Groundnut is predominantly a tropical crop worldover and to give further filip this crop was also added to the ICRISAT's mandate for crop research.

OBJECTIVES

The main objectives of the present study are:

a) To find out the growth of doctoral dissertations on groundnut in India;

b) To analyse and find out disciplinewise growth of doctoral dissertations submitted on groundnut;

c) To find out centres of Ph.D., research on groundnut in India

MATERIALS AND METHODS

Bibliographic information on Ph.D. dissertations submitted to universities/institutions in India was collected from various secondary sources including AIU Bibliographies on Doctoral Dissertations, University News (AIU), Bibliography on Indian Theses on Groundnut (ICRISAT), newsletters of scientific associations, journals etc., A Bibliography on Doctoral Dissertations on Groundnut was compiled for the period 1948 to 1996. The bibliography was analysed in terms of yearwise and disciplinewise growth of doctoral dissertations on groundnut and reported.

RESULTS AND DISCUSSION

Yearwise distribution of theses on groundnut by triennium ending since 1948 is presented in Table 1. A total of 323 Ph.D. theses on groundnut were submitted to 66 universities/institutions in India between 1948-1996 (Table 4). The data indicates a very slow growth of doctoral dissertations until 1975. In the first 27 years since 1948 only 43 theses (13% of the total theses) were produced. Significant trend of growth on groundnut theses was seen in the subsequent years during 1981-1992. A total of 280 theses were generated in a

Table 1

Yearwise distribution of theses on groundnut by triennium ending

Year	Number of Theses	Percentage to Total
1948-50	2	0.62
1951-53	0	-
1954-56	1	0.30
1957-59	2	0.62
1960-62	1	0.30
1963-65	7	2.17
1966-68	11	3.40
1969-71	10	3.10
1972-74	9	2.79
1975-77	15	4.64
1978-80	19	5.88
1981-83	43	13.31
1984-86	72	22.29
1987-89	46	14.24
1990-92	55	17.02
1993-95	27	8.36
1996	3	0.92
Total	323	100

Table 2

Contribution of agricultural and non-agricultural universities towards the growth of doctoral dissertations on groundnut 1948-1996

University	Number of Theses	Percentage
Agricultural Universities		
1. Angrau	36	11.14
2. IARI	22	6.81
3. PAU	21	6.50
4. MAU	19	5.88
5. PKV	17	5.26
6. GAU	17	5.26
7. MPKV	10	3.10
8. UAS, Bangalore	10	3.10

contd.

table 2 (contn.)

University	Number of Theses	Percentage
Agricultural Universities		
9. HAU	6	1.86
Others (10)	32	9.91
Non-Agricultural Universities		
1. SVU	26	8.05
2. Univ. of Madras	16	4.95
3. Osmania Univ.	13	4.02
Others (44)	78	24.14
Total	323	100

twenty two year period. Seventy percent of total theses on groundnut were submitted to 12 major universities (Table 2).

11.14 percent accounts for Acharya N.G. Ranga Agricultural University under agricultural universities category and 8.05 percent accounts for Sri Venkateswara University under non-agricultural universities category. 58.82% of theses on groundnut were submitted to 19 agricultural universities and 41.18% of the theses were submitted to 47 non-agricultural universities in India.

Disciplinewise analysis of data (Table 3) shows that until 1963-65 initial doctoral research was started in the disciplines of plant pathology, plant physiology and bio-chemistry. According to the data available the first thesis on groundnut submitted in 1948 related to the discipline of bio-chemistry. Theses in crop production accounted for 25.4 percent of total theses on groundnut

Table 3

Disciplinewise distribution of theses on groundnut generated during 1948-1996 (Triennium ending)

Year	Crop production	Crop improvement	Pl. path.	Pl. Physiology	Bio-Chem.	Econo. Statistics	Soil Sci. Agril. Chem.	Entomology	Micro-biol.	Agril. exten.	Aric. mktg.	Food exten.	Total
1948-50					2								
1951-53													
1954-56					1								

contd.

table 3 (contn.)

Year	Crop production	Crop improvement	Pl. path.	Pl. Physiology	Bio-Chem.	Econo. Statistics	Soil Sci. Agril. Chem.	Entomology	Micro-biol.	Agril. exten.	Aric. mktg.	Food exten.	Total
1957-59			1	1									
1960-62						1							
1963-65			2	4	1								
1966-68		1	1	5	3	1							
1969-71	2	2	3		1	1							
1972-74	1	3	1	3			1						
1975-77	4	2	3	4	2								
1978-80	5	6	5		2			1					
1981-83	9	12	6	7	3		4		1			1	
1984-86	19	16	8	12	7	4	1	4			1		
1987-89	16	8	7	4	3		3	3	1	1			
1990-92	19	7	13	5	3	5	1	1	1				
1993-95	7	5	2	3	3	3			2	1			
1996			1					1	1				
Total	82	62	53	48	31	15	10	10	6	3	21	323	

Table 4

List of universities producing theses an groundnut: grouped by number

Universities with one thesis

1. Aligarh Muslim University
2. Awadesh Pratap Singh University
3. Birsa Agricultural University
4. Gorakhpur University
5. Gujarat University
6. Jawaharlal Nehru Technological University
7. Jiwaji University
8. Kakatiya University
9. Kanpur University
10. Kerala Agriculturaal University
11. M.S. University of Baroda
12. Madurai University
13. Meerut University
14. Nagpur University
15. National Chemical Laboratory
16. Ravishankar University
17. Rohilkhand University
18. Shivaji University
19. Sukhadia University
20. University of Bhopal
21. University of Guwahati
22. University of Kalyani
23. University of Kerala
24. University of Pune
25. University of Udaipur

contd.

table 3 (contn.)

Universities with two theses

1. Annamalai University
2. Banaras Hindu University
3. Bidhan Chandra Krishi Vishwa Vidyalaya
4. Jawaharlal Nehru Krishi Vishwa Vidyalaya
5. Karnataka University
6. Nagarjuna University
7. Rajendra Agricultural University
8. Roorkee University
9. Sathya Rai Institute of Higher Learning
10. University of Bangalore
11. University of Baroda
12. University of Bombay
13. University of Calcutta
14. University of Delhi
15. University of Hyderabad
16. University of Sourashtra

Universities with three theses

1. Andhra University
2. Marathwada University
3. Sardar Patel University
4. University of Mysore

Universities with four theses

1. Agra University
2. Indian Institute of Science
3. Indian Institute of Technology
4. Orissa University of Agriculture and Technology

Universities with five theses

1. Chandra Shekhar Azad University of Agriculture and Technology
2. Rajasthan Agricultural University
3. Tamil Nadu Agricultural University
4. University of Agricultural Sciences, Dharwad
5. Vikram University

University with six theses

1. Haryana Agricultural University

Universities with ten theses

1. Maharashtra Phule Krishi Vidyapeeth
2. University of Agricultural Sciences, Bangalore

University with thirteen theses

1. Osmania University

University with sixteen theses

1. University of Madras

Universities with seventeen theses

1. Dr. Punjabrao Deshmukh Krishi Vidhyapeeth
2. Gujarat Agricultural University

contd.

table 3 (contn.)

University with nineteen theses

1. Marathwada Agricultural university

University with twenty one theses

1. Punjab Agricultural University

University with twenty two theses

1. Indian Agricultural Research Institute

University with twenty two theses

1. Indian Agricultural Research Institute

University with twenty six theses

1. Sri Venkateswara university

University with thirty six theses

1. Acharya N.G. Ranga Agricultural University

followed by crop improvement with 19.2%, plant pathology with 16.4%, plant physiology with 14.9%, bio-chemistry with 9.6% and other disciplines with 14.5%.

CONCLUSION

The bibliography compiled and analysed for the purpose of the study accounts for around 70% of the total state agricultural universities and 20% of the total traditional universities in India. It is observed that around 45 percent of the total theses were generated in the two important disciplines of crop production and crop improvements. There is need to tune the academic research with the mission oriented thrust areas identified by individual scholars at universities. This approach will help for sustainable productivity in groundnut in India. It is observed that a lot of efforts are needed by the universities for up to date bibliographic control of doctoral dissertations in India.

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7. *Total Expenditure on (CD-ROMs & Audio/Video)*
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INFORMATION SEEKING BEHAVIOUR OF PHYSICAL SCIENTISTS AND SOCIAL SCIENTISTS : A REPORT

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Deals with the similarities and differences in the information seeking behaviour of physical scientists and social scientists. Highlights the methods used by scientists for gathering information and their information needs. Also covers the various sources of information used by the scientists.

INTRODUCTION

Information seeking behaviour is an area of active interest among librarians and information scientists. It results from the recognition of some need perceived by the user, who as a consequence makes demand upon formal systems such as libraries, information centres, on-line services or some other person in order to satisfy the perceived need.

The study of information seeking behaviour can be dated back to the late 1940s. Since that time a large number of studies have been carried out on the various aspects of information seeking behaviour of the physical scientists and literature has been extensively reviewed. There is also a considerable amount of literature on the information seeking behaviour of social scientists which has also been extensively reviewed. However there have been lesser number of studies dealing with the similarities and differences in information seeking behaviour of these two groups particularly in India. The present study is an attempt to examine the information seeking activities of the social scientists and the physical scientists and the various formal and informal sources of information used by them.

OBJECTIVES OF STUDY

The objective of this explorative study is to cast light on the methods used by scientists for gathering information and their information needs. The aim is to find out how the scientists seek information and to what extent they use existing library and information services. The objectives of the study are to determine:

i) the various activities of the scientists and types of information used

ii) use of various formal and informal sources of information and the methods used in locating them

iii) use of secondary sources of information

iv) use of material in languages other than English

METHODOLOGY

A questionnaire was developed and distributed for the collection of data required for the purpose. This preliminary study is limited to the survey of scientists both from the social sciences and physical sciences fields working in Banaras Hindu University, Varanasi. The data analysis and interpretation is based on the response of 26 scientists belonging to both physical and social sciences disciplines.

DATA ANALYSIS AND INTERPRETATION

Respondents' distribution based on discipline

The sample population had 26 scientists. The

Table 1

Respondents distribution based on Discipline

Discipline	**Frequency**	**Percent**
Physical Sciences	9	34.6
Social Sciences	17	65.4
Total	26	100.00

Table 2

Respondents distribution by involvement in research

Discipline	Total No.	Involvement in research	Non-involvement in research
Physical Sciences	9	7(77.77)	2 (22.23)
Social Sciences	17	4(23.52)	12 (76.47)

(Note : Figure in the brackets indicate percentage)

physical scientists were nine in number whereas social scientists were 17 in number. (Table 1)

Respondents' distribution by involvement in research

When asked if the scientists were involved in teaching and research, majority of the physical scientists answered positively. This number was 7 (out of 9 or 77.77%).

The relatively low number of social scientists conducting research might be attributed to the lack of interest in research related activities or due to scarcity of research grants allocated in the area. Another reason might be that they were quite busy with the teaching work.

A comparison of answers of respondents related to their research and teaching activities showed that physical scientists and social scientists did more teaching than research work.

Table 3

Use of formal and informal channels of Information

Discipline	Total No.	Formal Channels	Informal	Both
Physical Sciences	9	7 (77.77%)	0	2 (22.22)
Social Sciences	17	15 (88.24%)	0	2 (11.76)

(Note : Figure in the brackets indicate percentage)

Use of formal and informal channels of information

Out of total 9 physical scientists, it was found that 7 made use of formal channels of information whereas 22.22% of the physical scientists used both the sources of information.

Among the social scientists, 15 or 88.24% used formal channels of information, whereas 11.76% used both the sources of information.

Table 4

Use of formal information sources

	Sources	Physical Scientists		Social Scientists	
i)	Journals	9	(100.00)	16	(94.12)
ii)	Monographs/Textbooks	4	(44.44)	14	(82.35)
iii)	Abstracting & Indexing Journals	7	(77.77)	3	(17.64)
iv)	Thesis/Dissertation	2	(22.22)	10	(58.82)
v)	Year Books	1	(11.11)	3	(17.64)
vi)	Dictionaries	0	(0)	2	(11.76)
vii)	Research Reports	6	(66.66)	7	(41.17)
viii)	Conference Proceedings	7	(77.77)	8	(47.05)
ix)	Year Books/Hand Books	3	(33.33)	4	(23.52)

(Note : Figure in the brackets indicate percentage)

Use of formal information sources

Table 4 shows that the journals were the most frequently used sources of information among the physical scientists as well as social scientists. Almost 100% of the physical scientists used journals for locating required information. The social scientists (94.11%) used journals for locating information required by them. Only 44.44% of physical scientists used books and monographs, whereas these were used by 82.85% of the social scientists.

From this it can be concluded that books and monographs have high relevance for the social scientists as compared to the physical scientists. Indexing and abstracting journals were used by 77.77% of the physical scientists whereas it was used by just 17.64% of the social scientists. This shows that social scientists did not make adequate use of abstracting and indexing journals. This finding confirms the findings of the studies conducted earlier by Brittain [1], Gutterman [2], Van Styvendaele [3] and Subrahmanyan [4] that social scientists do not make heavy use of indexing and abstracting periodicals to retrieve information. This may be attributed to the following facts.

i) The bibliographical tools are in some way inadequate to meet the requirements of social scientists.

ii) These tools are unknown to users.

iii) Users have a habit of using these tools without a strong tradition.

iv) A combination of the above reasons.

On the questions related to the use of secondary periodicals, 7 out of 9 physical scientists responded whereas the response rate among the social scientists was rather low as just 5 out of 17 attempted this question.

Tools and techniques used for current awareness

Table 5 reflects that in order to be in touch with the recent literature, the physical scientists resorted to scanning of current issues of periodicals, abstracting and indexing periodicals and current contents. The social scientists also scanned current issues of periodicals to a large extent. But the percentage of social scientists using abstracting and indexing periodicals and current contents was significantly low as compared to that of physical scientists.

Table 5

Tools & Techniques used for current awareness

	Methods	Physical Scientists	Social Scientists
1.	By scanning of current issue of periodicals	8 (88.88)	12 (70.5)
2.	Scanning of abstracting and indexing periodicals	7 (77.77)	4 (23.52)
3.	Scanning of Current Contents	5 (55.55)	4 (23.52)
4.	Through information services provided by NASSDOC, New Delhi		2 (11.76)
5.	By attending conferences/ Symposia/Workshops	2 (22.22)	15 (88.23)
6.	By personal correspondence	2 (22.22)	10 (58.82)

(Note : Figures in the brackets indicate percentage)

Table 6

Publication output of physical scientists and social scientists

Publications	Journal Articles	Books
Physical Sciences	9 (100)	6 (66.66)
Social Sciences	17 (100)	10 (58.88)

(Note: Figures in the bracket indicate percentage)

Table 7

Participation of physical and social scientists at conferences/seminars/workshops at various levels

Discipline	Total	Response	Number	Percentage
Physical Sciences	9	Yes	6	66.66
		No	3	33.33
Social Sciences	17	Yes	16	94.11
		No	1	5.88

Publication output

The table 6 shows that physical scientists and social scientists were actively and heavily engaged in publishing work. This may be attributed to 'Publish or Perish Syndrome'. In order to become well known or survive in their respective fields, the work of publishing articles in journals, writing books is of significance otherwise they will be at the losing end. As communication is the essence of science, the scientists consequent upon the completion of their research work, actively go for communicating their research findings. Expressing the new ideas, thoughts and recording it for communication is a very common phenomenon.

The figures show that all of the physical and social scientists had contributed articles in journals whereas 66.66% of the physical scientists and 58.88% of social scientists had books to their credit.

Abstracting and indexing journals used by social scientists and physical scientists are:

Physical Scientists

Physical Abstracts
Chemical Abstracts
Current Contents

Social Scientists

Index India
Psychological Abstracts
Sociological Abstracts
Indian Sociological Abstract
(ICSSR, New Delhi)
Dissertation Abstract International

Participation in conferences, etc.

Out of 9 physical scientists, six had participated in conferences or seminars at different levels (national, international, regional) whereas 16 out of 17 social scientists had participated in conferences or seminars as communication is the basic essence of science (Table 7).

The scientists participate in conferences with a view to develop contacts and have interaction with other experts of their own fields.

Use of material available in languages other than English

On the use of material (information available) in languages other than English, the behaviour of both the groups appeared similar. Most of the physical scientists (77.77) just consulted the material available in English. A minority (22.23%) of physical scientists also consulted material in languages other than English.

The social scientists (88.23%) consulted material available in English only. This tendency may be attributed to the fact that there is ample quality material available in English language.

Since English has acquired the status of being an international language, all new findings and observations are reported in English journals or books etc.

Table 8

Use of material available in languages other than English

Other languages	Physical Scientists	Social Scientists
Yes	2 (22.23)	2 (11.76)
No	7 (77.77)	15 (88.23)

(Note: Figures in the bracket indicate percentage)

Table 9

Types of information used

	Types of Information	Physical Scientists	Social Scientists
1.	Socio-economic Information	2 (22.22)	16 (94.12)
2.	R & D information	5 (55.55)	2 (11.76)
3.	Factual information	5 (55.55)	4 (23.52)
4.	Statistical information	3 (83.33)	2 (11.76)
5.	Conceptual information	2 (22.22)	4 (23.52)
6.	Current information	7 (77.77)	12 (70.58)
7.	Retrospective information	3 (33.33)	14 (82.35)

(Note: Figures in the bracket indicate percentage)

Types of information used

By observing the table 9 it is seen that the use of current information was maximum among the physical scientists. It was used by 77.77% of physical scientists. Developments occur in physical sciences at a very fast pace, so it is very essential for physical scientists to keep abreast with the latest developments in their fields. Among the social scientists group 'socio-economic information' was used by 94.12% of the social scientists followed by the use of 'retrospective' information which was used by 82.35% of them.

Table 10

Frequency of visit to library

Frequency	Physical Scientists	Social Scientists
Daily	1 (11.11)	2 (11.76)
Once in a weak	2 (22.22)	7 (41.17)
Once in a fortnight	1 (11.11)	3 (17.64)
Occasionally	5 (55.55)	4 (23.52)

(Note : Figure in the brackets indicate percentage)

Frequency of visit to library

Table 10 reflects that just 11.11% of physical scientists and social scientists visited the library daily. Just 22.22% of physical scientists and 41.17% of social scientists visited library once in a week. The figures show that social scientists and the physical scientists were not very regular in visiting the library.

Table 11

Usefulness of information sources and services of the library

Scientists	Adequate	Inadequate	Needs tremendous improvement
Physical Scientists	0	0	9 (100)
Social Scientists	4 (23.5)	0	13 (76.4)

(Note : Figures in the brackets indicate percentage)

Usefulness of information sources and services

The physical scientists and social scientists were very much dissatisfied with information sources and information services of the library. The general impression was that the whole library needs to be improved tremendously. This was suggested by 100% of physical scientists and 76.4% of social scientists.

CONCLUSION

The study reveals that there are significant differences in information seeking behavior of physical scientists and the social scientists. There are differences in their approach, information seeking process, difference of information needs and sources used for satisfying their information requirements.

The significant findings of the study are:

1. The physical scientists and social scientists did more teaching than research work. All physical scientists and 82.41% of social scientists were engaged in teaching work whereas 77.81% of the physical scientists and 23.51% of social scientists were involved in research pursuit. The relatively low number

of social scientists conducting research might be attributed to scarcity of research grants or the discipline is more theoretical, it does not involve much of laboratory work.

2. The study shows that majority of physical scientists and social scientists were heavily engaged in contributing articles in journals or writing books.

3. The physical scientists and social scientists used both formal and informal channels of information.

4. The primary journals were used by both groups of scientists. For social scientists books and monographs had a lot of significance.

5. The social scientists made very little use of abstracting and indexing periodicals whereas the physical scientists used them to a large extent.

6. In order to remain in touch with the latest developments in their fields, the physical scientists scanned current issues of periodicals, abstracting and indexing periodicals whereas social scientists took part in conferences and seminars to keep themselves upto date.

7. Majority of the physical scientists and social scientists just consulted the materials available in English.

8. All physical scientists and 75% of the social scientists were unsatisfied with the information sources and services offered at the libraries which they attended.

9. The socio-economic information was used by almost 95% of the social scientists whereas 77.77% of the physical scientists used current information.

The findings derived from the study are based on a sample of 26 physical scientists and social scientists. So the findings can not be generalised. Although the findings provide significant insight into the similarities and differences in the information seeking behaviour of the physical scientists and social scientists in India.

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INTERDISCIPLINARY NATURE OF LIBRARY SCIENCE

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Examines the interdisciplinary nature of library science. The review articles published from thirteenth to seventeenth volumes of 'Advances in Librarianship' are used for judging the interdisciplinary nature. Analyses the terms/ concepts pertaining to differenct subjects used in the review articles. The study reveals that the subject of library science has relations with twentynine other subjects, among which the subjects like telecommunication technology, computer technology and information storage technology have relation with it from practical point of view. The remaining subjects have relation with it by way of providing a theoretical basis to it or by utlising the services and products of it for their advancement.

INTRODUCTION

The universe of knowledge grows continuously. The efforts towards the generation of new knowledge, testing of the old one in the light of new principles, deriving new conclusions etc. leads towards the emergence of new subjects. Every subject has some contribution to the welfare of mankind. If we look at this phenomenon from the angle of system analysis, all the subjects are the subsystems of the major system i.e. universe of knowledge. To achieve the common goal, each subsystem has to work cohesively with other subjects. This leads to the necessity of making use of certain tools, techniques, laws, principles, methods etc. developed in one field into the other related fields. This gives rise to interdisciplinary research activities. The subject of library science has the goal of procurement, analysis, organisation, maintenance and dissemination of information. To meet the ever changing needs of the users of information, it is imperative on the part of the library science personnel to make use of tools, techniques, principles, etc. developed in the fields of statistics, cognitive science, psychology, management science, computer science, telecommunication technology, information storage technology etc. Hence library science is not only an interdisciplinary but also a multidisciplinary subject by its nature.

In the present paper an attempt has been made to study the relationship of different subjects with library science.

METHODOLOGY

There are review publication available in most of the subjects. Some are entitled as reviews, for instance, *Annual Review of Information Science and Technology.* Some publications are not entitled as reviews but they carry review articles. Some are entitled as *'Advances'* in a particular subject. *Advances in Librarianship* is one such publication which provides the reviews. According to Voigt "There has long been a need for a continuing series to provide scholarly reviews of the rapidly changing and advancing field of librarianship, a series which would select subjects with particular current significance to the profession and provide an analysis of the advances made through research and practice. *Advances in Librarianship* is planned and designed to fill this need" [1].

For the present study, the review publication entitled *Advances in Librarianship* has been selected. Since the study of all the seventeen volumes published till now leads to a huge amount of data, only the last five volumes [2,3,4,5,6], i.e., volume thirteenth to seventeenth have been selected for the study. The total number of review articles published in these five volumes are fortyone (41). By going through the contents, introduction and the full article/s, the kernel terms denoting the 29 subjects with which the library science subject has got relationship have been identified and the same have been presented in the Table 1. Based on this table, Table 2 has been prepared to present the data denoting the frequency of the occurence of subjects in total number of articles. The data thus presented has been analysed and the conclusions have been drawn.

Table 1

Term analysis of review articles

Sl. No.	Title of the Review	Terms in the Text
1.	Management Information for Library Decision Making (Adv.Lib.13:1984:1-48)	Computer Technology, Management Science, Psychology, Telecommunication Technology, System Analysis.
2.	Subject Access in the On-Line Environment (Adv.Lib.13:1984:49-98)	Computer Technology, Information Storage Technology, Telecommunication Technology, Linguistics, Artificial Intelligence, Lexicography.
3.	Community Information Services - An Innovation at the Beginning of its Second Decade (Adv.Lib.13:1984:99-128)	Sociology, Cognitive Science. Computer Technology, Information Storage Technology, Telecommunication Technology, Political Science, Education.
4.	IFLA and The Recent Growth of Organised International Librarianship (Adv.Lib.13:1984:129-150)	Management Science, Economics.
5.	Information Systems and Library Automation in Latin America (Adv.Lib.13:1984:151-184)	System Analysis, Computer Technology, Information Storage Technology, Telecommunication Technology, Agricultural Science, Medicine, Lexicography.
6.	From Book Selection to Collection Management: Continuity and Advance in an Unending Work (Adv.Lib.13:1984:185-210)	Cognitive Science, Management Science, Statistics, Psychology.

contd.

table 1(contn.)

Sl. No.	Titles of the Reviews	Terms in the Text
7.	Quality and Library Collections: New Directions in Research & Practice in Collection Evaluation (Adv.Lib.13:1984:211-238)	Statistics, Research Methodology, Cognitive Science, Computer Technology.
8.	Important Literature Identification in Science: A Critical Review of the Literature (Adv.Lib.13:1984:239-258)	Statistics.
9.	The History of Information (Adv.Lib.14:1986:1-48)	Sociology, Economics, Education, History, PublicationTechnology, Cognitive Science, Psychology, Mass Communication, Computer Technology, Telecommunication Technology, Management Science, Audio-Visual Technology, Statistics.
10.	Information Needs (Adv.Lib.14:1986:49-74)	Psychology, Cognitive Science, Statistics, Sociology, Management Science.
11.	Administrators and Information: A Review of Methodologies used for Diagnosing Information use (Adv.Lib.14:1986:75-100)	Cognitive Science, Psychology, Management Science, Linguistics.
12.	Government Information Policy in the German Democratic Republic (Adv.Lib.14:1986:101-142)	Sociology, Political Science, Economics, Mass Communication, Publication Technology, Audio-Visual Technology.
13.	The College Library Collection (Adv.Lib.14:1986:143-174)	Education, Cognitive Science, Management Science, Statistics.
14.	Academic Branch Libraries (Adv.Lib.14:1986:175-210)	Management Science, History, Education, Reprography, Telecommunication Technology.
15.	State, Class and Cultural Reproduction: Toward a Theory of Library Service in the United States (Adv.Lib.14:1986:211-252)	Sociology, Political Science, Anthropology, Education, Economics.
16.	Archival Management and Librarianship: An Exploration of Prospects for their Integration (Adv.Lib.14:1986:253-284)	History and Archaeology, Information Storage Technology.

contd.

table 1(contn.)

Sl. No.	Titles of the Reviews	Terms in the Text
17.	Some Perils of the "User-Friendly" Attitude in Cataloguing (Adv.Lib.14:1986:285-304)	Cognitive Science, Psychology, Linguistics, Computer Technology, Telecommunication Technology, Information Storage Technology.
18.	The Transfer of Library Skills to Nonlibrary Contexts (Adv.Lib.15:1991:1-28)	Management Science, Cognitive Science, Computer Technology, Information Storage Technology, Telecommunication Technology, System Analysis, Education, Publication Technology.
19.	The Scholorly Vocation and Library Science (Adv.Lib.15:1991:29-76)	Sociology, Education, Cognitive Science, Publication Technology, Management Science.
20.	Ethnic Libraries and Librarianship in the United States: Models and Prospects. (Adv.Lib.15:1991:77-102)	Sociology, Cognitive Science, Political Science.
21.	Advances in Chinese Library and Associated Information Services since the Mid -1970s. (Adv.Lib.15:1991:103-154)	Political Science, Economics, Education, Sociology, Reprography, Information Storage Technology, Cognitive Science, Computer Technology, Telecommunication Technology, Arts.
22.	Governance of Library Networks: Structures and Issues. (Adv.Lib.15:1991:155-174)	Computer Technology, Information Storage Technology, Telecommunication Technology, Law, Management Science.
23.	Between Scylla and Charybdis: Subject Searching in the Online Catalog. (Adv.Lib.15:1991:175-236)	Computer Technology, Information Storage Technology, Telecommunication Technology, Cognitive Science, Management Science, Psychology, Linguistics, Artificial Intelligence, Statistics.
24.	Area Studies in United States Libraries. (Adv.Lib.15:1991:237-276)	Area Study, History. Economics, Computer Technology, Telecommunication Technology, Information Storage Technology, Management Science, Reprography, Statistics.
25.	Document Delivery: A Primary Service for the Nineties (Adv.Lib.16:1992:1-32)	Computer Technology, Information Storage Technology, Telecommunication Technology, Artificial Intelligence, Publication Technology, Reprography.

contd.

table 1(contn.)

Sl. No.	Titles of the Reviews	Terms in the Text
26.	Cooperative Cataloging: Models, Issues, Prospects (Adv.Lib.16:1992:33-82)	Computer Technology, Information Storage Technology, Telecommunication Technology, Reprography, Economics.
27.	The Marc Format: Private Road or Public Highway? (Adv.Lib.16:1992:83-92)	Computer Technology, Information Storage Technology, Telecommunication Technology, Economics, Management Science.
28.	Strategic Quality Management in Libraries (Adv.Lib.16:1992:93-106)	Management Science, Statistics
29.	Digital Technology: Implication for Library Planning (Adv.Lib.16:1992:107-126)	Computer Technology, Information Storage Technology, Telecommunication Technology, Optical Technology, Law, Reprography, Management Science, Artificial Intelligence
30.	Buying Publisher's Trade Paperbacks Versus Hardbacks: A Preventive Conservation Strategy for Research Libraries. (Adv.Lib.16:1992:127-152)	Management Science, Arts, Psychology, Mathematics.
31.	The Future of Library Science in Higher Education: A Crossroads for Library Science and Librarianship. (Adv.Lib.16:1992:153-182)	Education, Sociology
32.	The European Communities: Reference Works and Documentary Sources of Spanish Parliament. (Adv.Lib.16:1992:183-216)	Sociology, Economics, Law, Political Science, Computer Technology, Information Storage Technology, Telecommunication Technology
33.	Information Specialists and the Cooperative Work Place: Challenges and Opportunities. (Adv.Lib.17:1993:1-32)	Computer Technology, Information Storage Technology, Telecommunication Technology, Management Science, Artifical Intelligence, Reprography.
34.	Ownership Versus Access: Shifting Perspectives for Libraries. (Adv.Lib.17:1993:33-60)	Computer Technology, Information Storage Technology, Telecommunication Technology, Publication Technology, Law.
35.	Access to Electronic Information: Exploring the Options. (Adv.Lib.17:1993:61-78)	Computer Technology, Information Storage Technology, Telecommunication technology, Artifical Intelligence.

contd.

table 1(contn.)

Sl. No.	Titles of the Reviews	Terms in the Text
36.	Research Libraries: Past, Present & Future. (Adv.Lib.17:1993:79-110)	Computer Technology, Information Storage Technology, Telecommunication Technology, Psychology.
37.	The Online Catalog: from Technical Services to Access Service. (Adv.Lib.17: 1993: 111-148)	Computer Technology, Information Storage Technology, Telecommunication Technology, Artificial Intelligence.
38.	Electronic Journals: A Formidable Challenge for Libraries. (Adv.Lib.17:1993:149-174)	Computer Technology, Publication Technology, Information Storage Technology, Telecommunication Technology, Artificial Intelligence.
39.	Output Measures for Evaluating the performance of Community College Learning Resources Programs: A California Case Study (Adv.Lib.17:1993:175-202)	Audio-Visual Technology. Statistics, Psychology, Management Science, Computer Technology, Information Storage Technology.
40.	New Patterns for Scholorly and Bussiness Communication in Denmark. (Adv. Lib.17:1993:203-224)	Computer Technology, Information Storage Technology,Telecommunication Technology, Artificial Intelligence, Publication Technology.
41.	The International Federation of Library Associations and the United States: What Happiness Next? (Adv.Lib.17:1993:225-246)	Publication Technology, Management Science, Psychology, Information Storage Technology, Telecommunication Technology, Education.

(Adv.Lib. = Advances in Librarianship.)

Table 2

Frequency of Occurrence of Terms

Sl. No.	Interdisciplinary Subjects	Frequency of Occurrence	Percentage Frequency
1.	Telecommunication Technology	26	11.87
2.	Computer Technology	25	11.41
3.	Information Storage Technology	23	10.50
4.	Management Science	20	9.13
5.	Cognitive Science	13	5.94

contd.

table 2 (contn.)

Sl. No.	Interdisciplinary Subjects	Frequency of Occurrence	Percentage Frequency
6.	Psychology	11	5.02
7.	Sociology	10	4.56
8.	Education	10	4.56
9.	Statistics	10	4.56
10.	Publication Technology	9	4.11
11.	Economics	9	4.11
12.	Artificial Intelligence	9	4.11
13.	Reprography	7	3.20
14.	Political Science	6	2.74
15.	Law	4	1.83
16.	Linguistics	4	1.83
17.	History and Technology	4	1.83
18.	Audio-Visual Technology	3	1.37
19.	Systems Analysis	3	1.37
20.	Arts	2	0.91
21.	Mass Communication	2	0.91
22.	Lexicography	2	0.91
23.	Anthropology	1	0.46
24.	Medical Science	1	0.46
25.	Research Methodology	1	0.46
26.	Optical Technology	1	0.46
27.	Agricultural Science	1	0.46
28.	Area Study	1	0.46
29.	Mathematics	1	0.46
	Total	219	100.00

ANALYSIS

From the analysis of the data, it is clear that library science subject has relationship with twentynine other subjects. Since the main purpose of library science is to study and manage the process of information generation and its communication, the telecommunication technology is playing a very important role. Hence telecommunication technology occupies the highest rank among the subjects. Presently computer technology is playing a vital role in each and every field. As the industrial revolution has augmented the human muscles, the computer revolution has augmented the human brain. Computer technology thus occupies the second rank among the subjects. The different information storage devices have enabled us not only to collect large amounts of information but also to store in compact forms and retrieve quickly. Hence information storage technology is the third important subject with which the library science has relationship. Management science has provided different techniques, procedures, principles etc. to the field of library science, like principles of scientific management, personnel administration, job analysis, job evaluation, marketing of information, etc. Cognitive science enables one to know the different dimensions of generation of knowledge etc. Psychology aids in knowing the behavioral aspects of users of information which helps in the collection and dissemination of required information at the right time.

As the libraries have to serve the society where they exist, it is essential for the library science professionals to understand society. Hence sociology is having relations with library science. Education provides different methods of imparting library science education. It also helps in raising the literacy rate through the different methods of education. Statistics has become a common subject by its application in almost all the subjects. For library science personnel, it enables one to study the existing phenomena, compare it with the past and predict the future requirements. The advancement of publication technology has contributed to the field of library science a lot by way of publication of information in numerous forms thus resulting in the changes in the information gathering and disseminating activities. Economics helps to make maximum use of available resources at a minimum cost. Artifical intelligence aids the library science professionals to manage their work more efficiently than before. Reprography has helped in the reproduction of documents in different sizes, store the information safely for long periods of time and disseminate it at the least cost. Audio-visual technology provides the information services in an effective manner and also serves the physically handicapped persons with required type of information. Systems analysis has provided the technique of analysis of the library system into different subsystems and developing each subsystem to contribute to the achievement of common goal of the library system more efficiently. Linguistics has helped to develop information retrieval systems. Mass communication has provided different ways of dissemination of information more effectively. Research methodology helps in the advancement of the field of library science by providing different techniques of conducting research. The other subjects like law, history and archaeology, arts, lexicography, anthropology, medical science, optical technology, agricultural science, area study, mathematics etc. are related with library science in one or the other way. Thus library science has relationships with twentynine other subjects.

From the analysis, it is clear that the library science professionals are making use of the tools, techniques, principles and procedures of different subjects. Telecommunication, computer, information storage, audio-visual and reprographic technologies are having more applicability in practice and the remaining subjects have either provided theoretical base for the advancement of library science subject or they have made use of information for their development.

CONCLUSION

Library science subject has been growing as a specialised field and for its advancement it is imperative on the part of the professionals to make use of the tools, techniques, principles, procedures etc. developed in other related subjects. A similar study was conducted by Gopinath and Patil [7] to know the inter-disciplinary nature of information science and technology. The review articles used for the study by Gopinath and Patil were from the *Annual Review of Information Science and Technology.* As per their study, the computer technology and telecommunication technology have the highest frequency of occurrence. The present study has also confirmed that the telecommunication technology and computer technology have a maximum frequency of occurrence.

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AUTOMATED CIRCULATION SYSTEM USING CLIPPER

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The paper discusses the salient features of an automated circulation system, designed and developed to suit the requirements of a medium sized academic library using the software CLIPPER, a DBMS compiler. All the procedures designed to perform various functions are menu-driven and have the provision of on-line help.

In this package documents are broadly classified under books and serials. And membership is categorized into four types each having a distinct borrowing capacity, as shown below:

User Type	Book Capacity	Serial Capacity
'T' (Teachers)	15	10
'R' (Research Scholars)	10	03
'S' (Students)	04	01
'N' (Non-Teaching)	02	01

As far as fines are concerned, it is uniform to all four types of users.

SOFTWARE

Clipper is a DBMS compiler and is published by Nantucket Inc. This developed package is based on summer '87 version. The features of clipper are:

- CLIPPER development environments are self-contained.
- The provision of Arrays which are memory based data tables that can be created and used to speed up programs.
- The facility of providing context sensitive helps.
- The user-defined functions which can be called as if they are built in.
- The facility to open 255 files.

MINIMUM REQUIREMENTS

The following are required to operate the package:

a) An IBM PC or a true compatible.
b) MS-DOS version 2.0 or higher
c) At least 640 KB of RAM
d) dBASE III Plus (optional)

OBJECTIVES

A computerised circulation system requires a database comprising of the documents, members and daily transactions record. The information generated is basically of three types.

1. Information about the members who borrow the collection which includes member's name, identification number, department, occupation, address for communication, date of registeration, capacity to borrow books and serials etc.
2. Bibliographic information about collection to be borrowed includes Acc. No., Call No., Author, Title, Place, Publisher, Year etc.
3. Information about document transaction which includes date of issue, due date, membership no, member name, etc.

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*Associate Professor & Head **Senior Research Fellow ***Associate Professor

DIFFERENT TYPES OF FILES

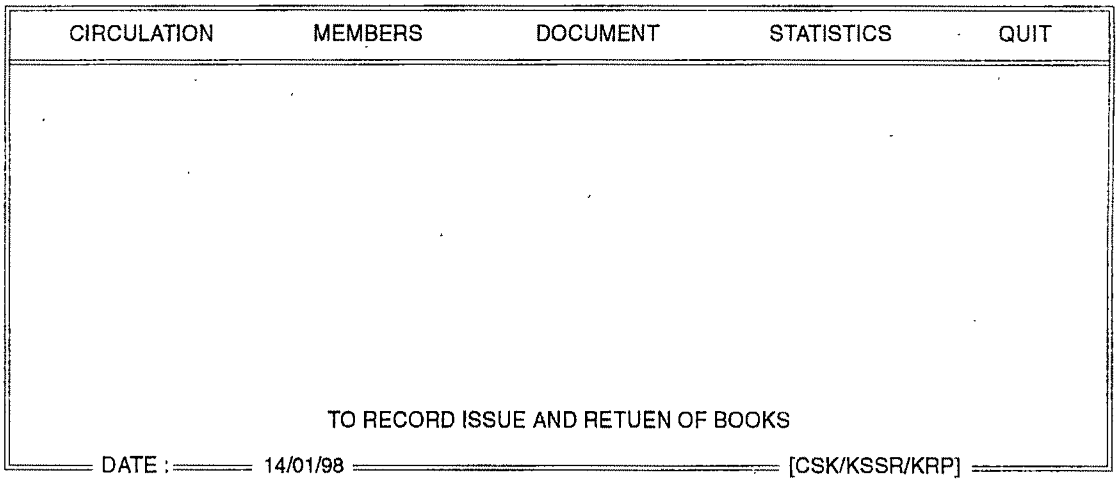
In order to meet the above objectives, seven files have been created. They are:

01. Books. dbf
02. Serial. dbf
03. Members. dbf
04. Bootran. dbf
05. Seritran. dbf
06. Control. dbf
07. Reserve. dbf

The database of books and serials are created to store details of the above documents by inventory system. The member file stores all the details of members. Bootran and Seritran databases, the most important files store records for all the transaction details. Reservation details are stored in the reserve file. The control file is created to generate numbers for the numeric part of membership number automatically.

Circulation Process

The software can be loaded in the hard disk by typing *load* which will create a directory named *clip on* that drives and loads the package into it. The software can be executed by typing *RAM.* The main menu has four options (fig 1), which are discussed below:



TO RECORD ISSUE AND RETUEN OF BOOKS

DATE : 14/01/98 [CSK/KSSR/KRP]

Fig. 1 : Main menu

1. Circulation

The circulation option is designed to perform the following functions.

a) recording the issue and return of books and serials to members.

b) generation of reminders to borrowers with overdue books and serials.

c) calculation of fines for overdue books and serials.

d) issuing of no-dues certificate to non-members/ members whose membership is cancelled.

e) acceptance of reservation for books/serials.

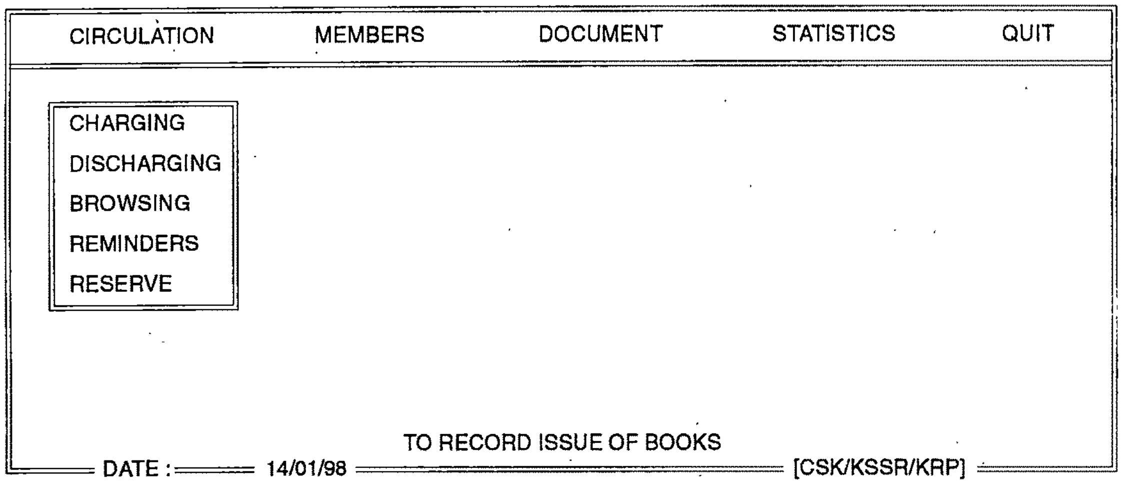
f) displaying the list of books and serials by their titles borrowed by a particular member and along with their borrowing status.

On selecting this option, a sub-menu of five options appear on the screen (fig 1.1)

1.1 Charge

The charge option again has a sub menu of books and serials. If books is selected, the charging sheet is displayed on the screen prompting for member no. When it is entered, the system will display the member name and borrowing status. If borrowing capacity is not exhausted, the accession number can be entered to record the issue of the item, otherwise a message will appear on the screen.

Sorry !!! your quota is over



TO RECORD ISSUE OF BOOKS

DATE : 14/01/98 [CSK/KSSR/KRP]

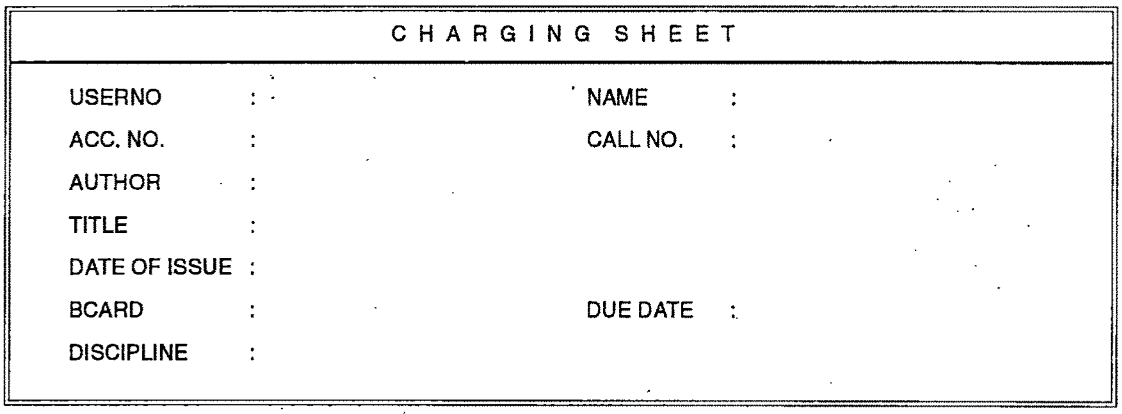
Fig. 1.1 : Circulation menu

1.2 Discharge

The screen output for discharging books is shown in fig.1.3 It has also two options viz. books and serials.

While recording the return of books, the procedure verifies the due date. If it is greater than due date, the amount of fine to be paid by the members is displayed and the print out of receipt can be taken. The number of days for fine calculation excludes holidays and sundays as well.

During charging and discharging process, there is little scope for manipulating the dates of issue and return.



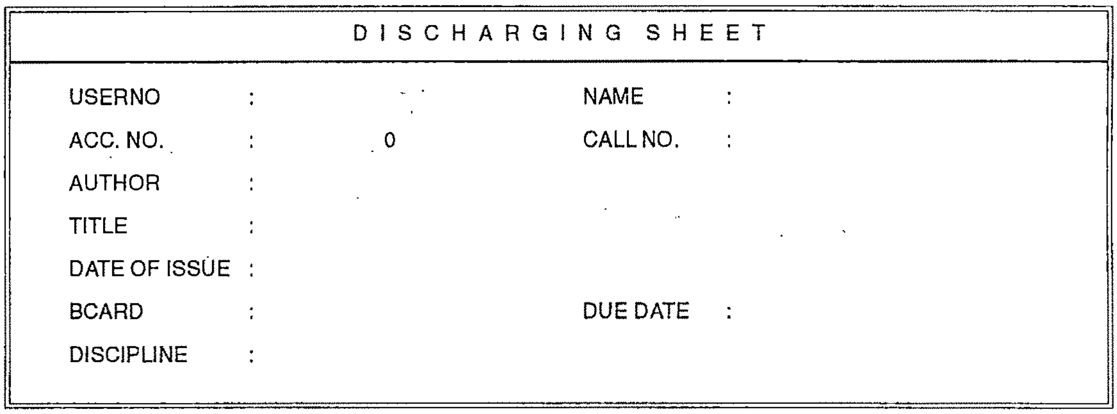
CHARGING SHEET

USERNO :
NAME :
ACC. NO. :
CALL NO. :
AUTHOR :
TITLE :
DATE OF ISSUE :
BCARD :
DUE DATE :
DISCIPLINE :

Fig. 1.2 : Charging sheet

1.3 Reserve

This option takes care of reservation of books and serials by members. The reservation form will seek the membership number and accession number of the item. The other details viz. Membername, Call No., Title and date of reservation are automatically displayed on the screen. Before making reservations for a book, the reserve file will be verified to know the reservations already made for the same item with the help of serial number, to assign the order of priority. The reservation form is shown in fig. 1.4.



DISCHARGING SHEET

USERNO :		NAME :	
ACC. NO. :	0	CALL NO. :	
AUTHOR :			
TITLE :			
DATE OF ISSUE :			
BCARD :		DUE DATE :	
DISCIPLINE :			

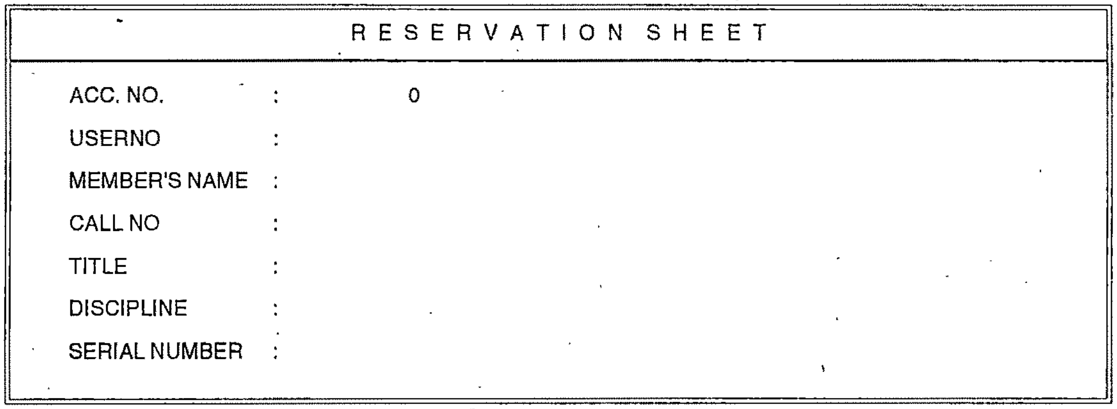
Fig. 1.3 : Discharging sheet

1.4. Remind

Selection of this option will generate and print reminders for over-due books.

1.5. Browse

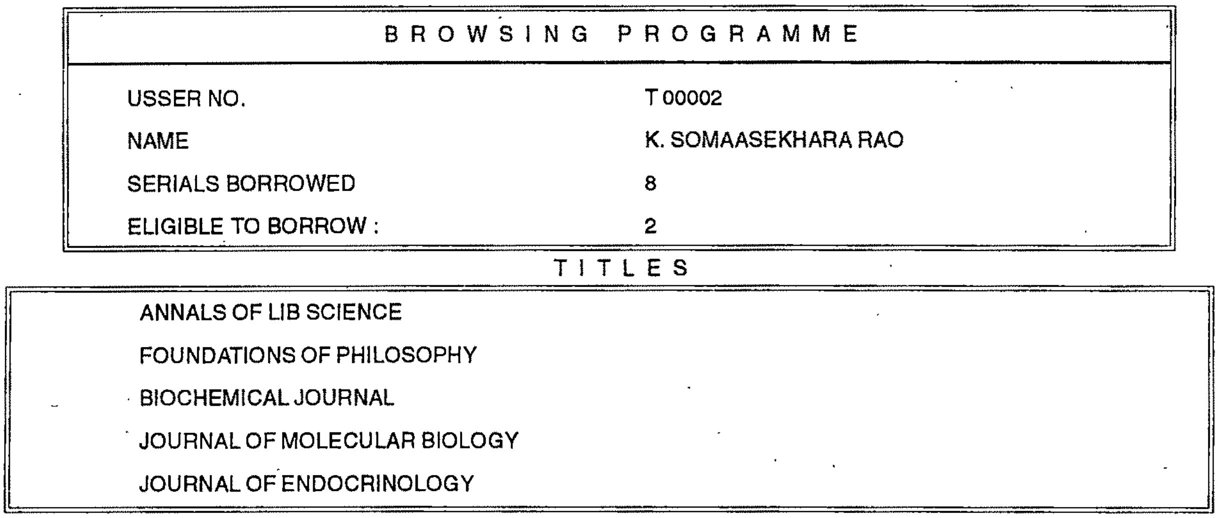
The Browse programme facilitates the browsing of books and serials issued to members by their titles and displays their borrowing status. When a member no. is entered, the displayed screen is as at fig 1.5. It has two options, books and serials.



RESERVATION SHEET

ACC. NO. : 0
USERNO :
MEMBER'S NAME :
CALL NO :
TITLE :
DISCIPLINE :
SERIAL NUMBER :

Fig. 1.4 : Reservation sheet



BROWSING PROGRAMME

USSER NO.	T 00002
NAME	K. SOMAASEKHARA RAO
SERIALS BORROWED	8
ELIGIBLE TO BORROW :	2

TITLES

ANNALS OF LIB SCIENCE
FOUNDATIONS OF PHILOSOPHY
BIOCHEMICAL JOURNAL
JOURNAL OF MOLECULAR BIOLOGY
JOURNAL OF ENDOCRINOLOGY

Fig. 1.5 : Browsing programme

2. Members

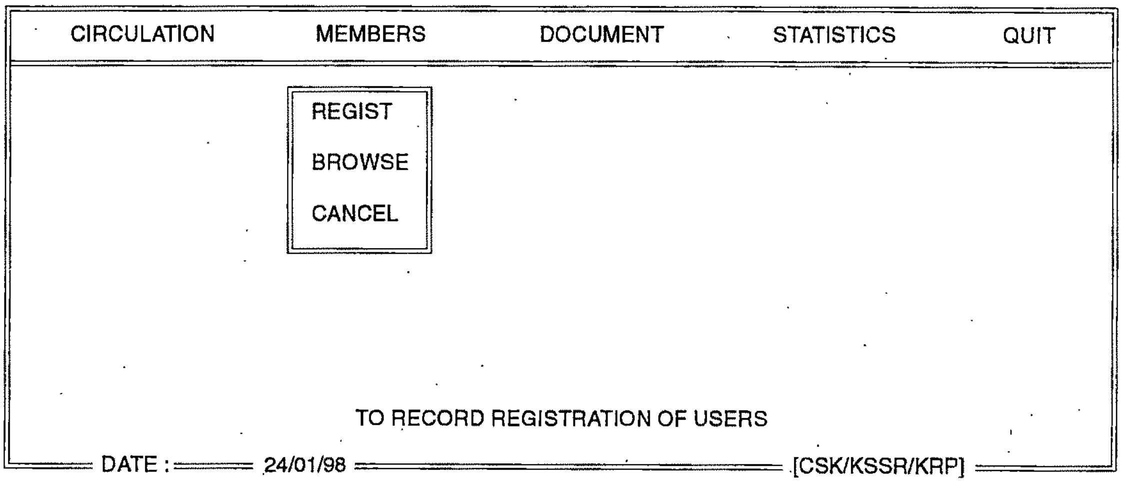
The members menu (fig.2) is designed to grant membership, cancel membership and issue no-dues certificate. In other words, it performs the following functions:

a) Registration of members
b) Cancellation of membership
v) Issuing no-dues certificate

This menu has three options viz. Regist, Browse, Cancel.

2.1 Regist

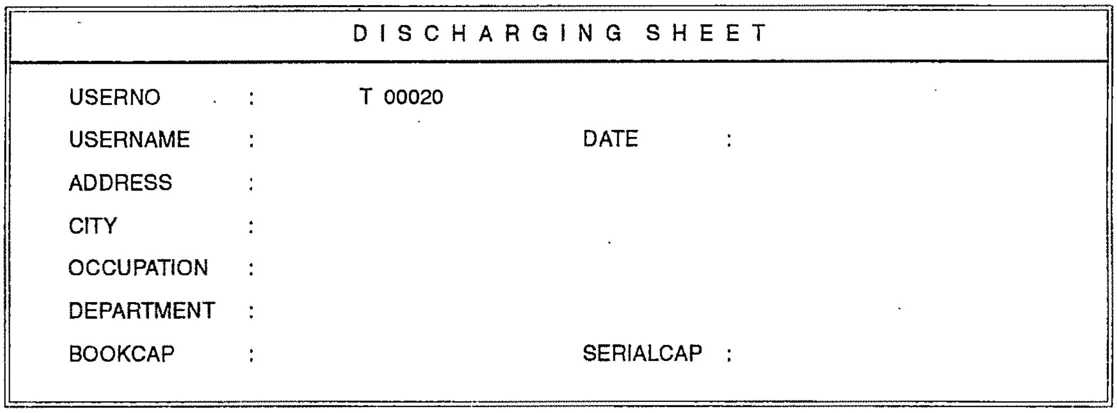
Before adding a new member, the member database is checked to ensure if that person is already a member. Each member is prefixed with an alphabet and a number which is automatically generated by the control file. This automatic generation of member number relieves the burden of checking the number assigned to the last member registered. The alphabatic part of member number is also for identifying the category. In order to prevent the unauthorized use of this option a password has to be typed along with the person's name who is authorized to use it.



TO RECORD REGISTRATION OF USERS

DATE : 24/01/98 [CSK/KSSR/KRP]

Fig. 2 : Membership menu



DISCHARGING SHEET

USERNO : T 00020
USERNAME : DATE :
ADDRESS :
CITY :
OCCUPATION :
DEPARTMENT :
BOOKCAP : SERIALCAP :

Fig. 2.1 : Registration form

The alphabetic part of member number has to be only of four types T - Teaching Staff, R - Research Scholars, S - Students, N - Non-Teaching. The program is designed not to accept any other alphabet other than the above four.

2.2 Browse

The browse option is designed to browse various details of the members. All the fields of the record are displayed on the screen on entering the member number.

2.3. Cancel

This option is designed to cancel membership. This programme requires a password and user's name to operate. A hard copy of no-dues certificates can be taken if required through this option.

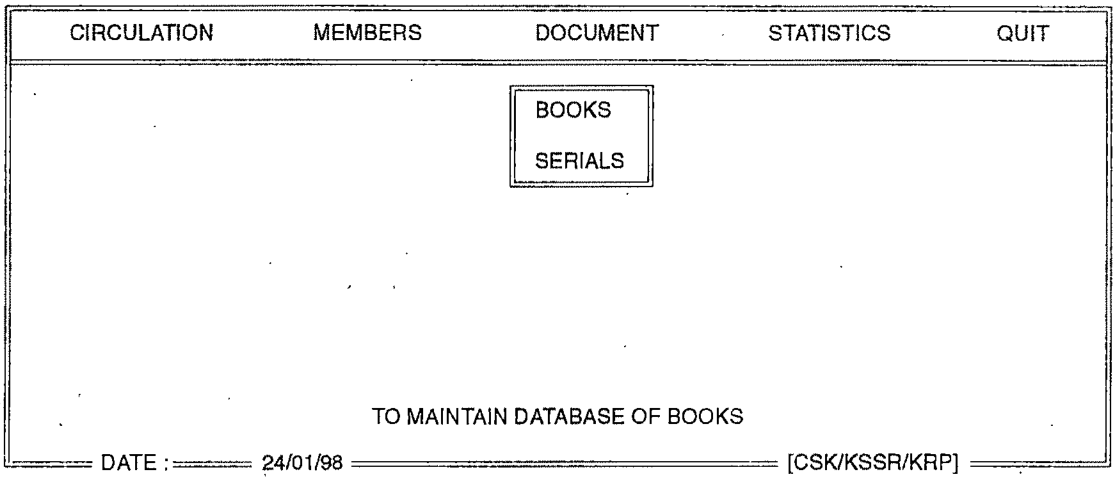
3. Documents

The document option is designed to maintain the database of books and serials by inventory system. The following functions are assigned to this option.

a) Addition of new arrivals of books and serials databases.

b) Deletion of records of weeded out books.

c) Browsing of records by author, title and call number to answer queries on availability of books and serials.



TO MAINTAIN DATABASE OF BOOKS

DATE : 24/01/98 [CSK/KSSR/KRP]

Fig. 3.1 : Document menu

d) Editing of records in case of change with regard to call no.

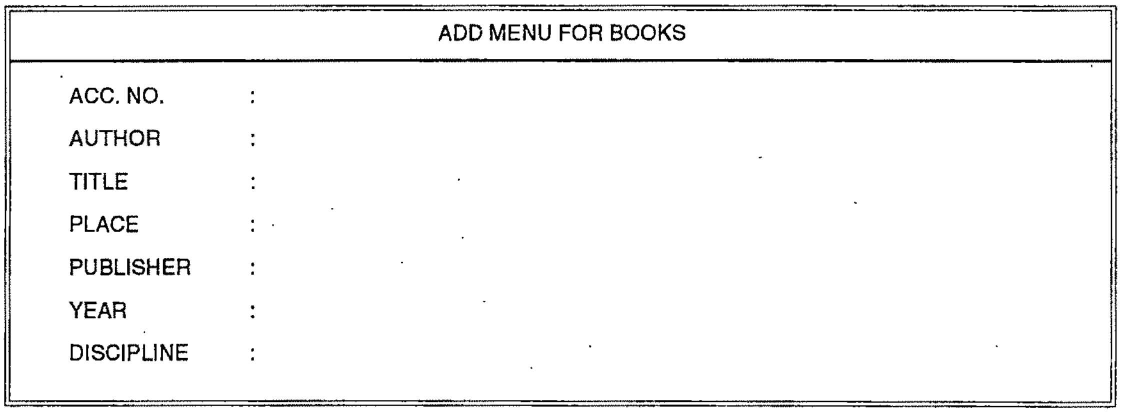
The document has a sub-menu of books and serials, each of these two have again been assigned four options viz. Add, Browse, Edit and Delete.

3.1. Add

The Add program will add the new arrivals of books and serials to these databases which are available for loan.

3.2. Browse

The browsing program is designed to answer queries on availability of books and serials. The provision of arrays in CLIPPER facilitates the designing of on-line help with all three access points. When the access point author is selected, the invoking of the function key (FI) displays the list of authors (alphabetically) on the screen along with the title of the books, out of which, the desired ones can be selected by pressing the return key. The other details are automatically displayed on the screen including its availability. The browsing program of serials has also three access points namely serial no., title and subject.



ADD MENU FOR BOOKS

ACC. NO. :

AUTHOR :

TITLE :

PLACE :

PUBLISHER :

YEAR :

DISCIPLINE :

Fig. 3.2 : Add menu

3.3. Edit

The edit option allows the change of fields viz. call no. of the book, if there are any changes.

3.4. Delete

The delete option is also restricted to authorized persons who can operate it by typing and the required password and their name. This program will delete all such records of the books in the database, which the management decides to weed out. In case of serials, the volume of issues which are sent for binding are deleted in the serials database.

4. Statistics

Statistics of various operations are necessary for decision making. For instance, the data on the number of books available in all the disciplines will reflect the strengths and weakness in the collection. The reservation statistics will help in knowing the demand for a particular item, so that more copies of such items can be procured to meet the demand.

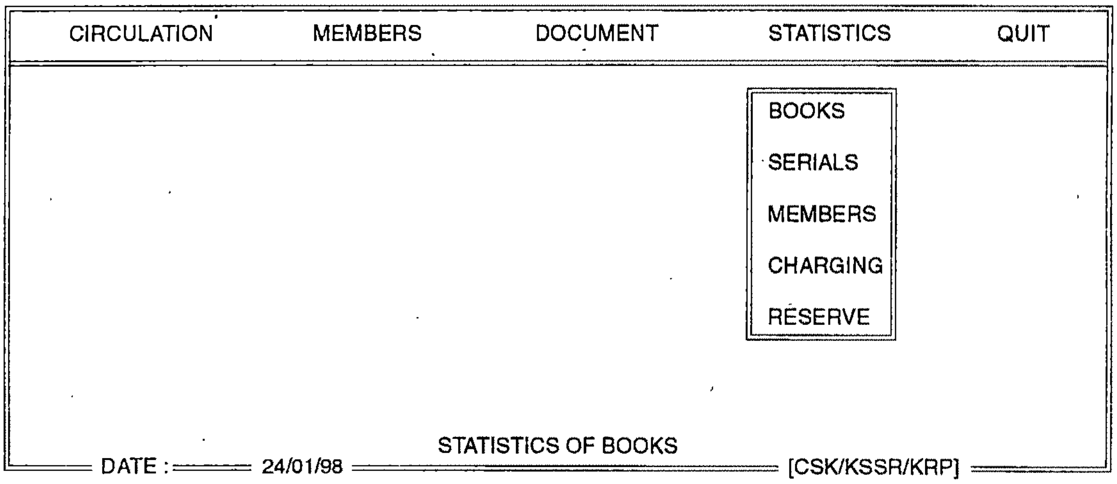
This menu has five options.

4.1. Books

This menu has again two options.

4.1.1. Bookstat

This option will show the total number of books available in the library on a particular or given date.



STATISTICS OF BOOKS

DATE : 24/01/98 [CSK/KSSR/KRP]

Fig. 4.1 : Statistics menu

4.1.2. Bookdstat

The number of books available in a particular discipline on a given date will be displayed on selecting this option.

4.2. Serials

This has two options.

4.2.1. Seristat

This option will show the total number of serials subscribed by the library in all disciplines on a given date.

4.2.2. Seridstat

The number of serials subscribed in a particular discipline on a given date will be shown by this option.

4.3. Current Status

It has two options.

4.3.1. Charstat

The charstart option will reveal the total number of books issued on a particular day.

4.3.2. Chadstat

This option will show the number of books issued on a particular discipline on a given date. Similarly the number of serials issued on a particular date, as well as the number of serials issued in a particular discipline can also be displayed on the screen by Charstat and Chadstat options.

4.4. Memstat

The memberstat option will display the number of members in each category.

4.5. Resestat

The resestat displays the list of all such items on the screen which are reserved by three or more than three members on any item. These statistics will indicate the items which are in demand.

5. Quit

After the day's transaction, on selecting the quit option the program allows to take backup, restore, reindex and copying of all database files on a floppy disk in event of any malfunction or system's failure.

ADVANTAGES

This CLIPPER based circulation system has the following advantages:

(i) Member's query on the availability of books can be answered quickly.

(ii) Browsing of books and serials by multiple access points through on-line helps facilitate the members in identifying the books on their topic of interest available in the library.

(iii) Certain operations like, registration, cancellation of membership, weeding out of books by deletion, charging and discharging have restricted access in order to prevent any malpractices.

(iv) The inventory system of maintaining the database of books and serials helps the members in identifying the documents available in the collection of library on their topic of interest.

(v) The statistical data on issues can help in analysing the adequacy of collection subjectwise.

(vi) The statistical data in reservation of books and serials may help in procuring more copies of such items.

(vii) The data on number of books available in each discipline may facilitate in knowing the adequacy of collection in each discipline and formulating a judicious acquisition policy in the library.

(viii) Above all, effective utilization of staff is possible by analysing the statistics of work load.

The output of almost all functions are given in the appendix in order to understand the package properly.

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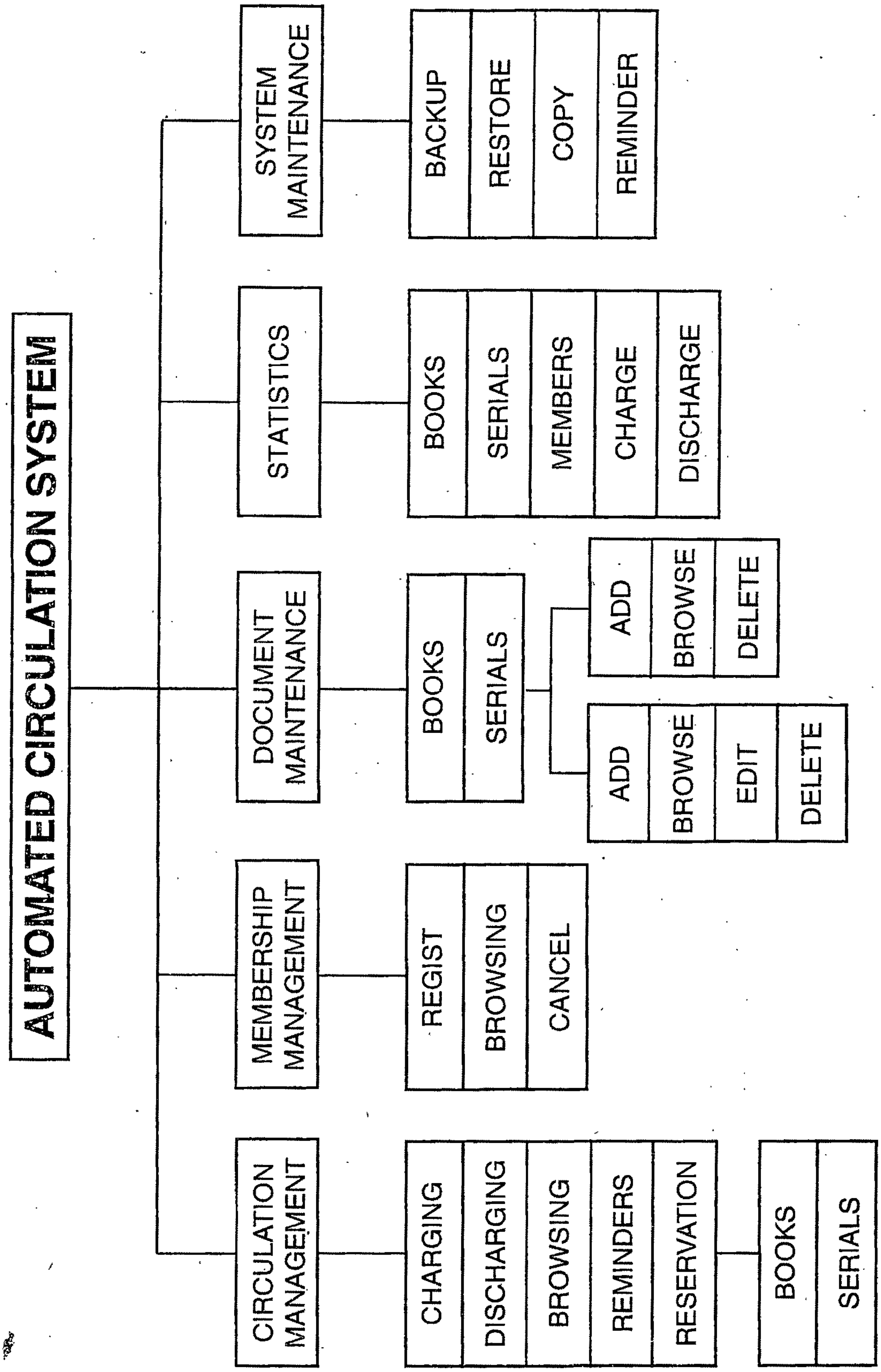
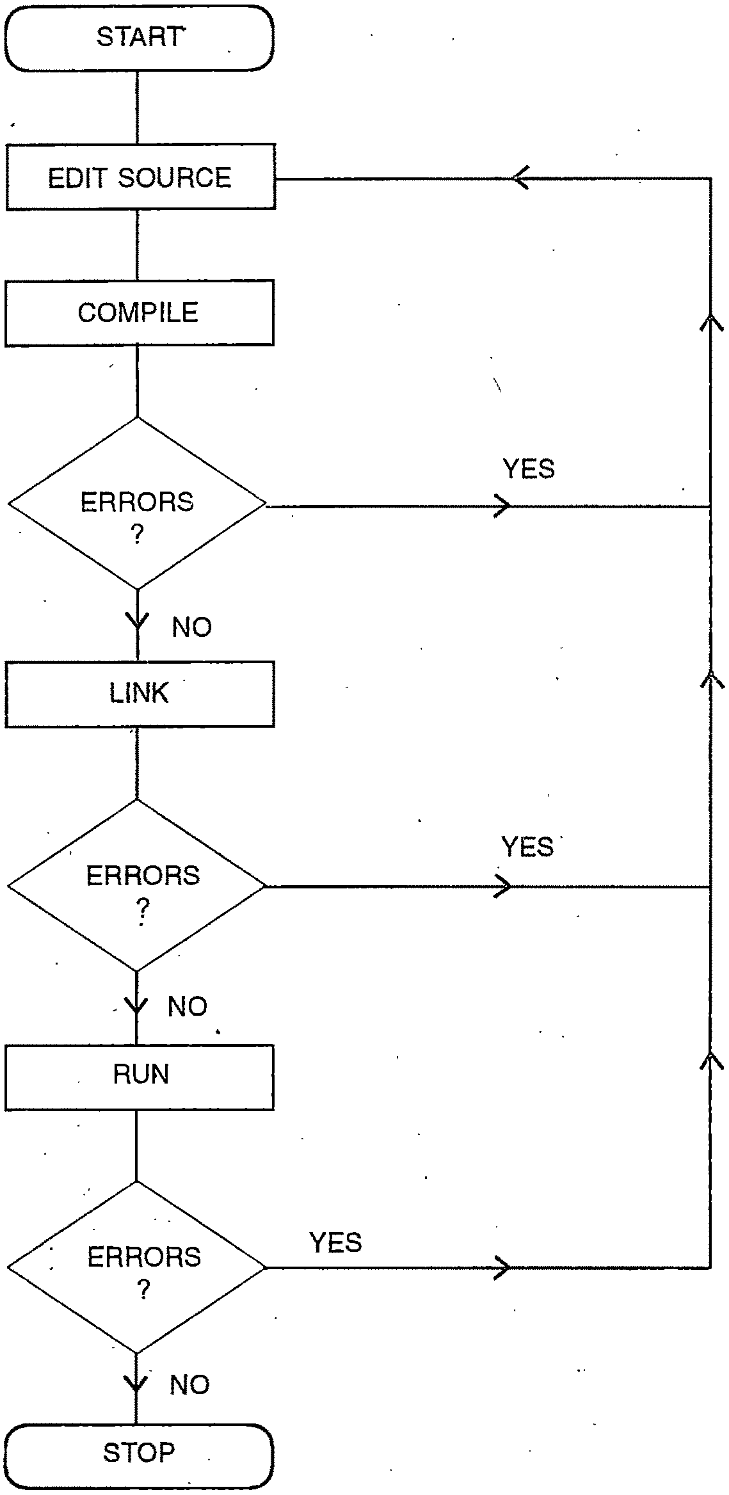
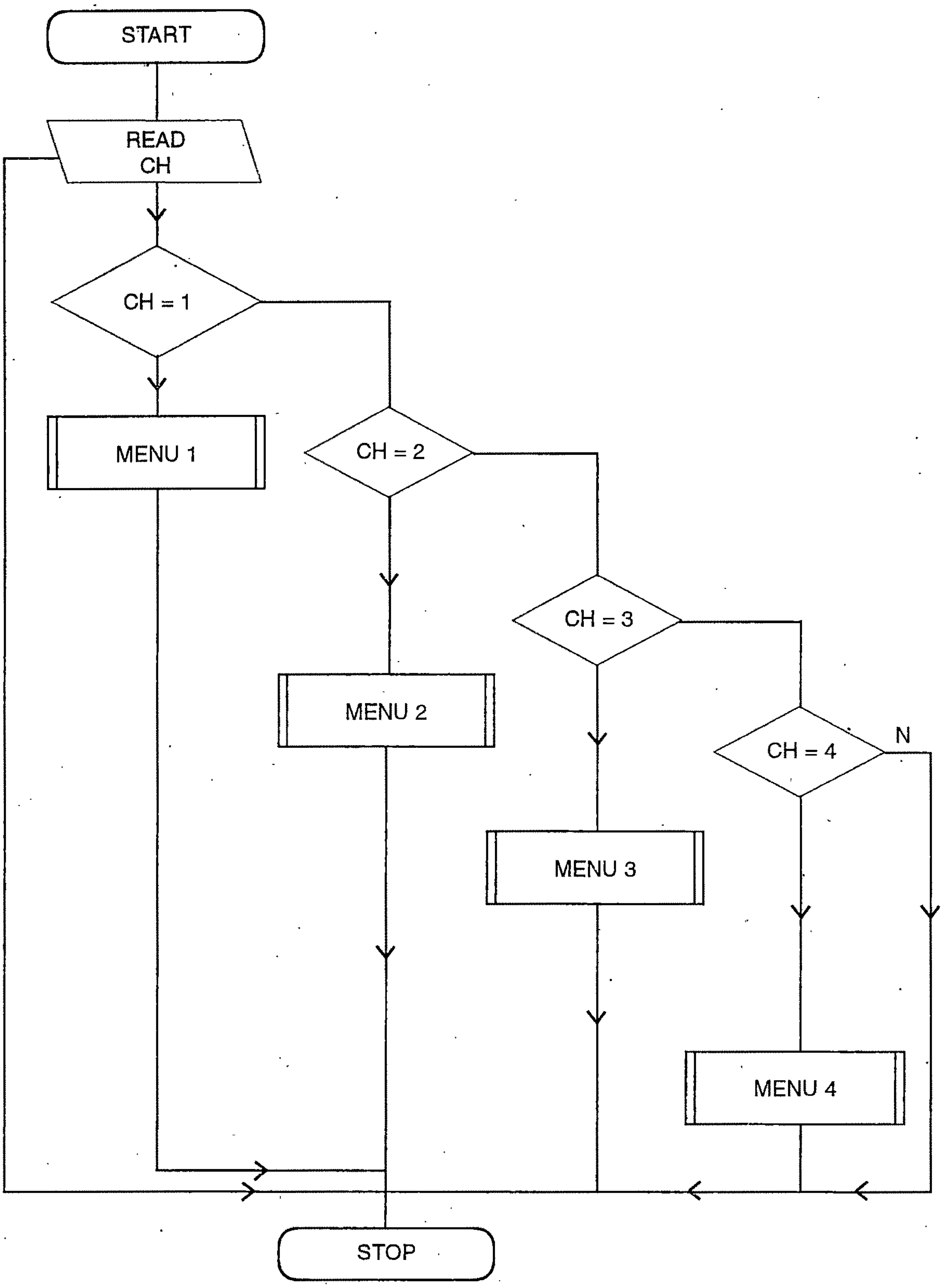
Appendix



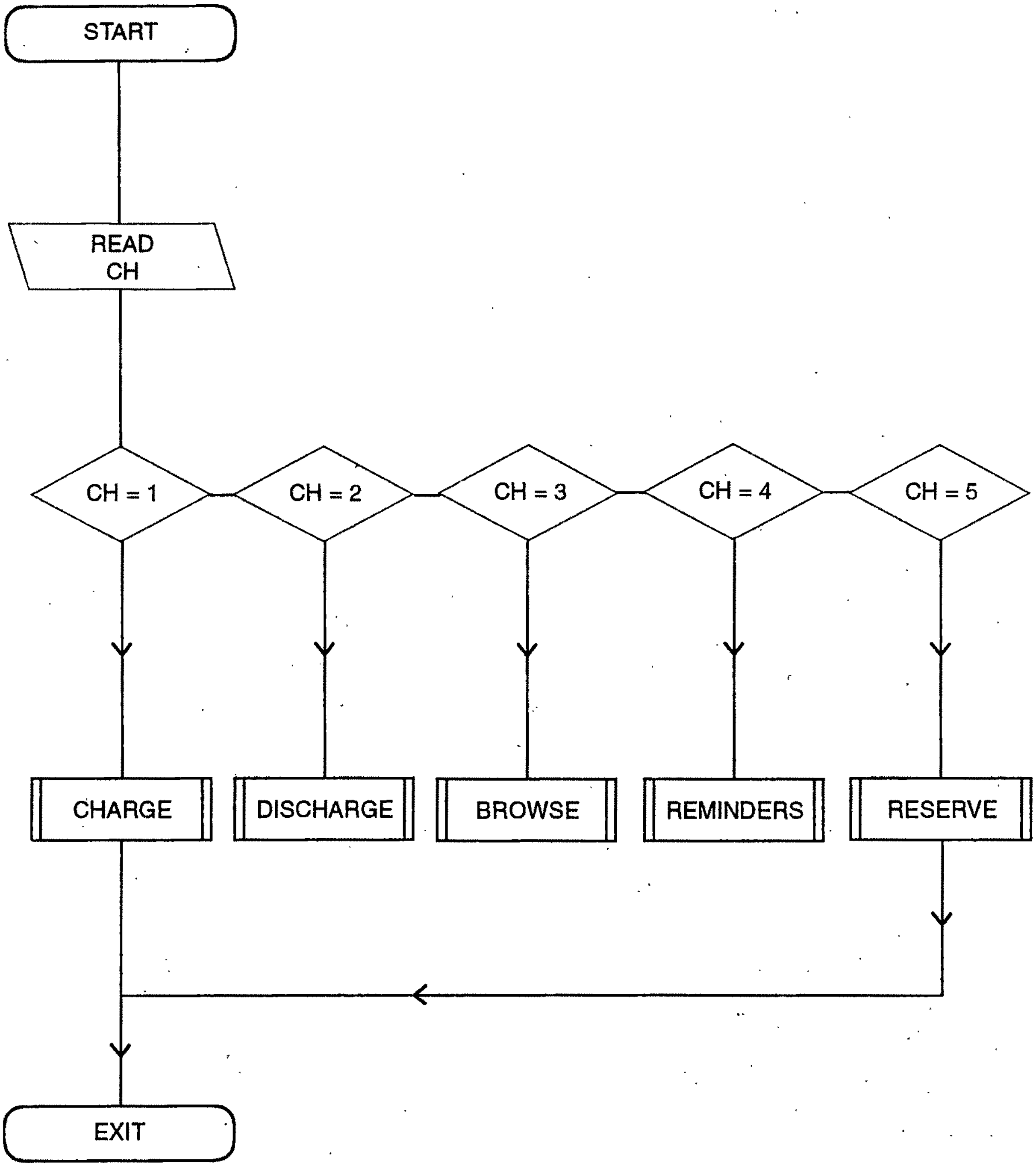
PROGRAM STRUCTURE



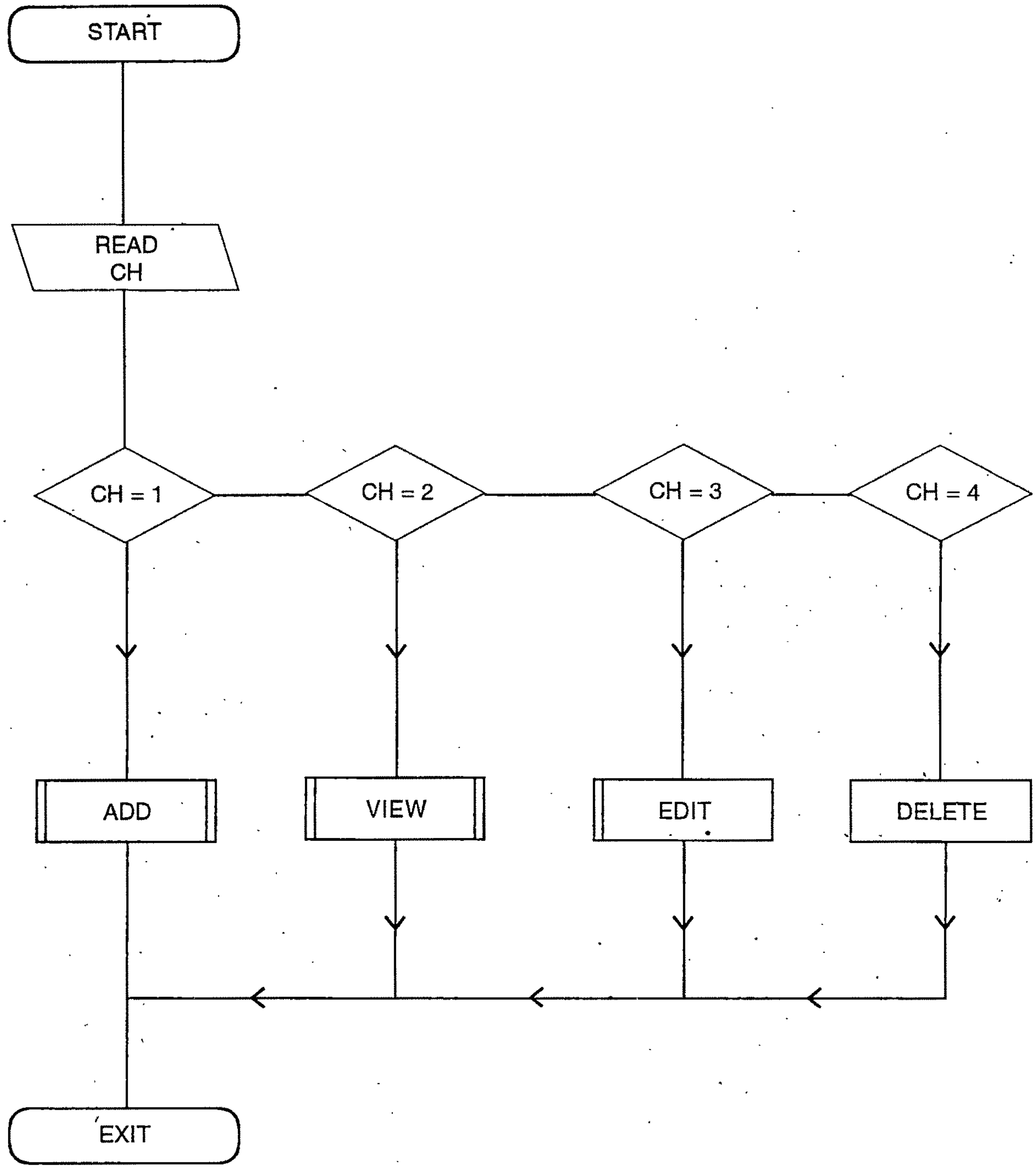
FLOW CHART SHOWING DEVELOPMENT CYCLE IN CLIPPER



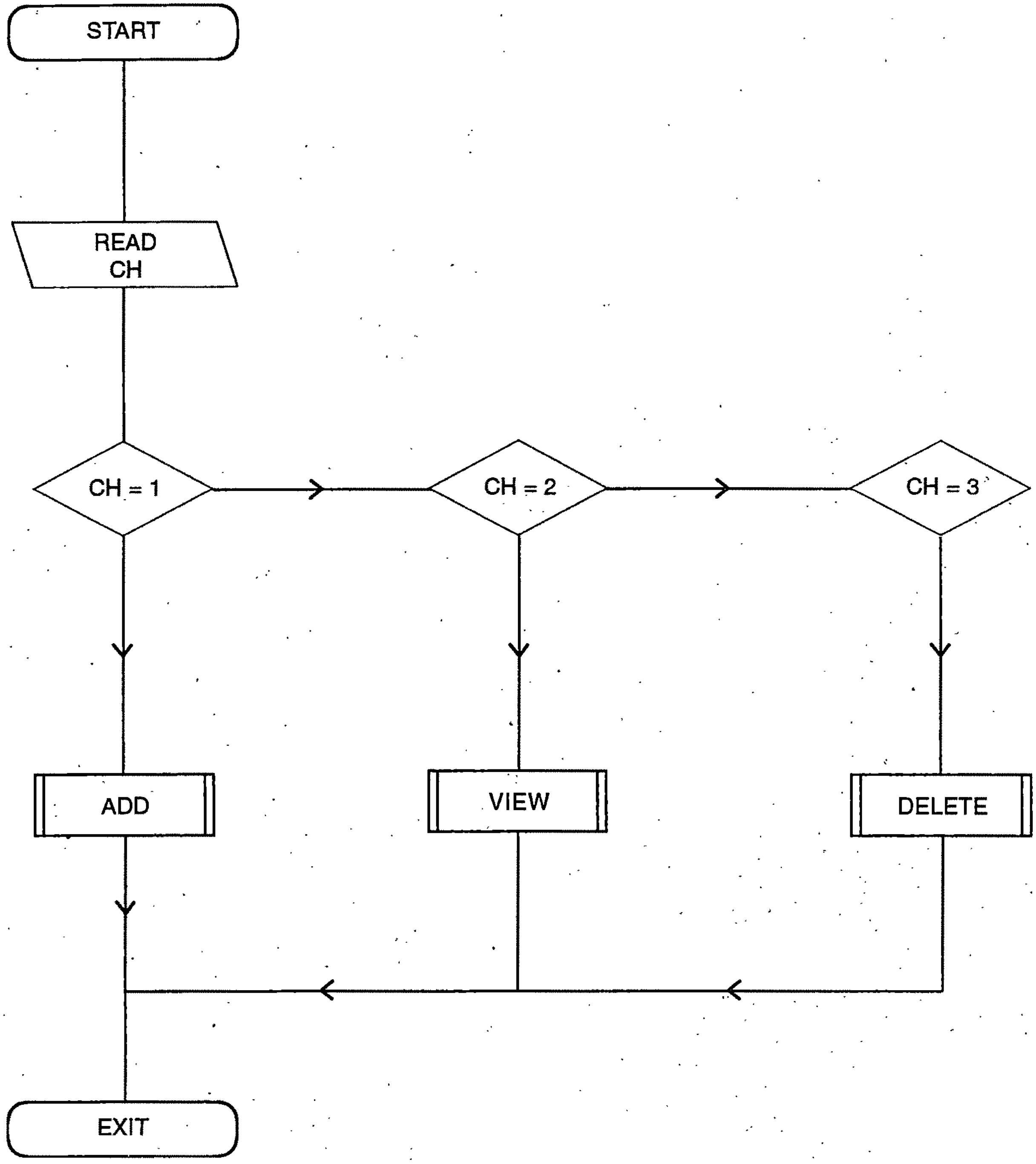
FLOW CHART OF MAIN MENU



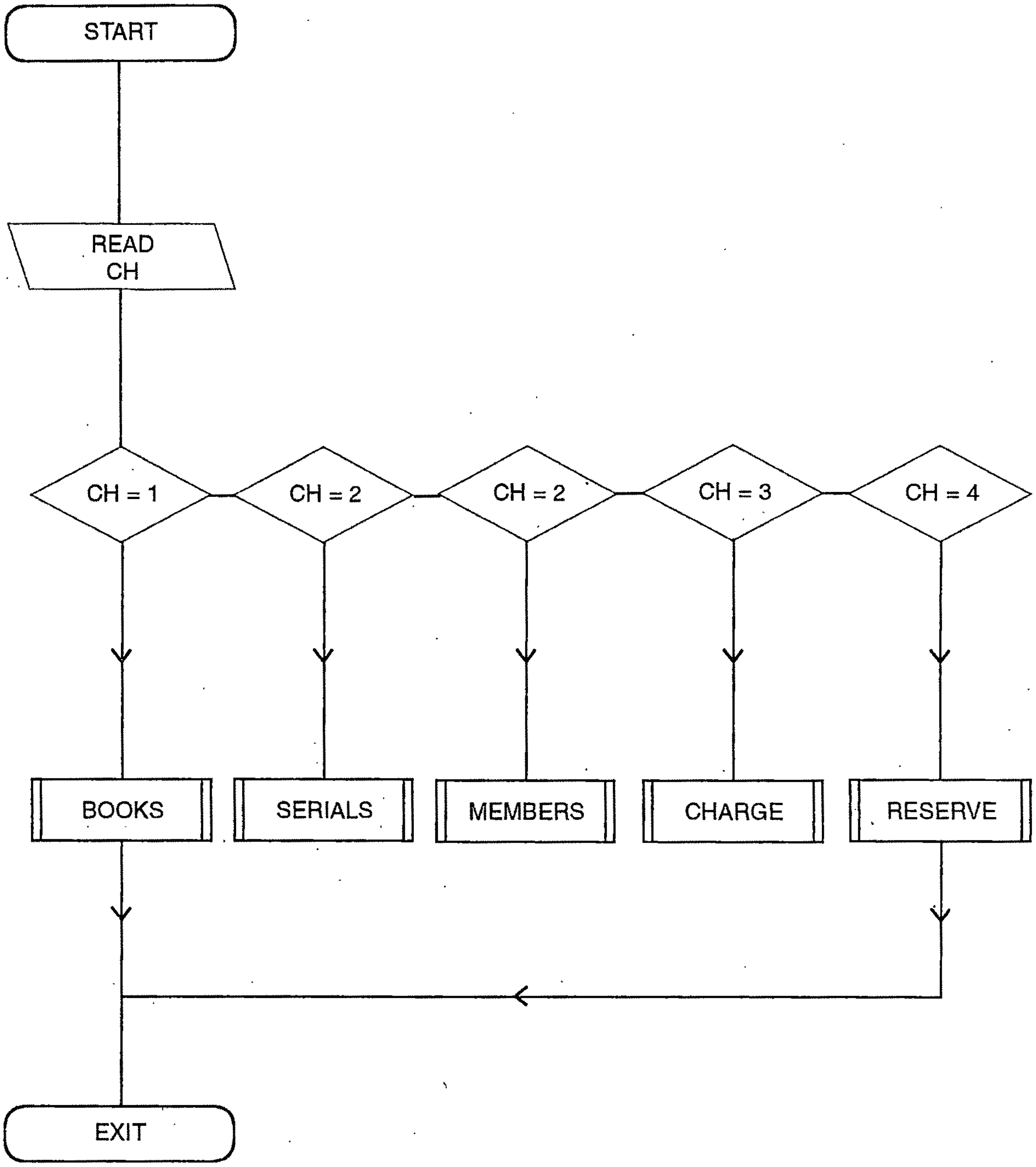
FLOW CHART OF CIRCULATION MENU



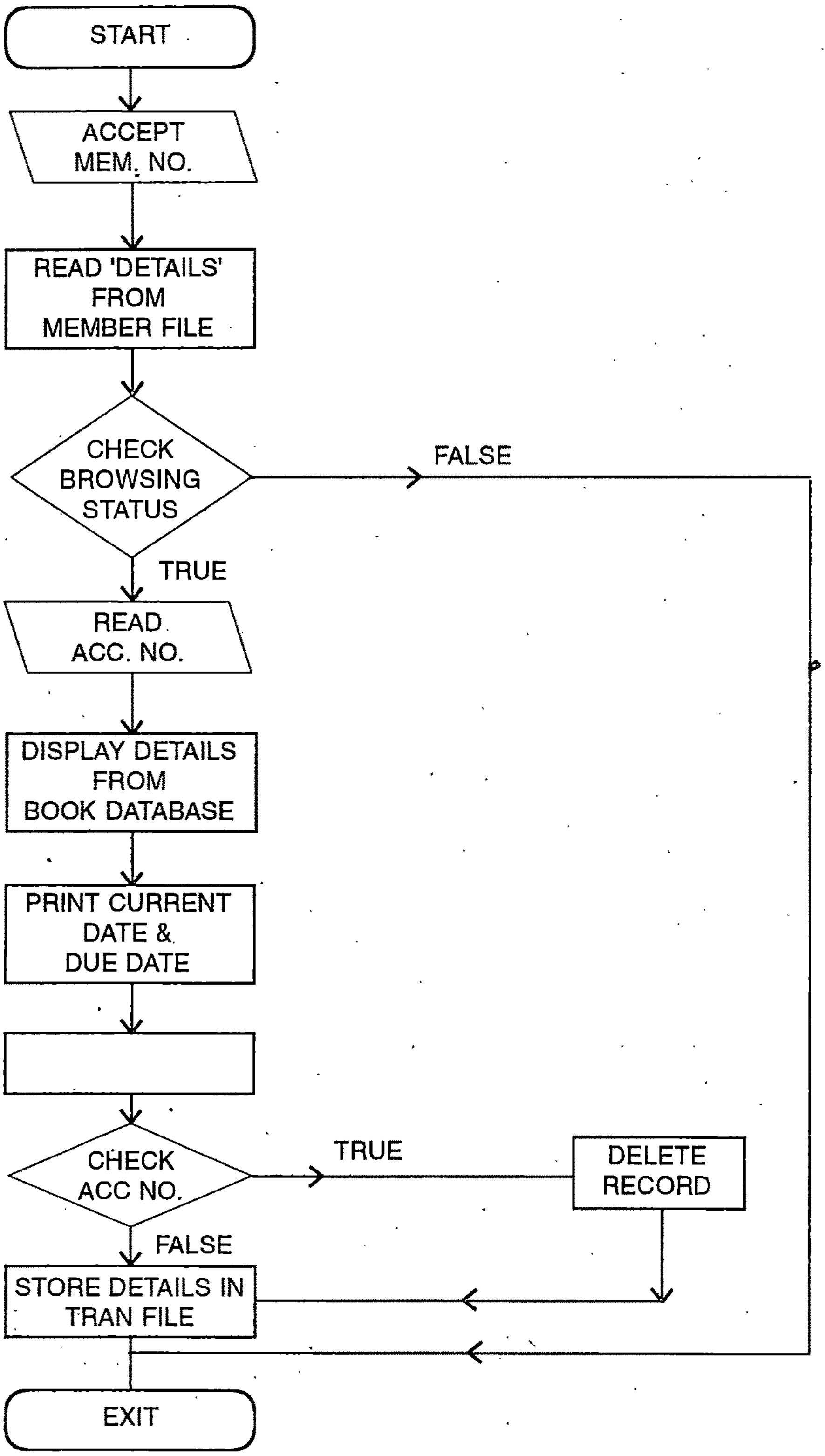
FLOW CHART OF SUBMENU OF (BOOKS) DOCUMENT MENU



FLOW CHART OF SUBMENU OF (SERIALS) DOCUMENT MENU



FLOW CHART OF STATIATICS MENU


START
ACCEPT MEM. NO.
READ 'DETAILS' FROM MEMBER FILE
CHECK BROWSING STATUS
FALSE
TRUE
READ ACC. NO.
DISPLAY DETAILS FROM BOOK DATABASE
PRINT CURRENT DATE & DUE DATE
CHECK ACC NO.
TRUE
DELETE RECORD
FALSE
STORE DETAILS IN TRAN FILE
EXIT

FLOW CHART OF CHARGING PROGRAM

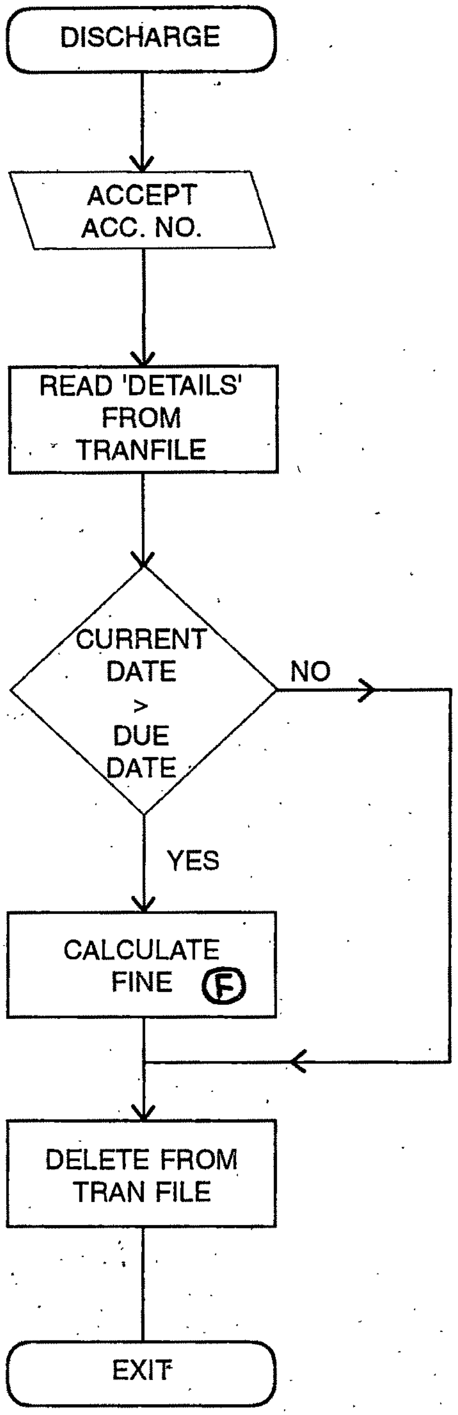
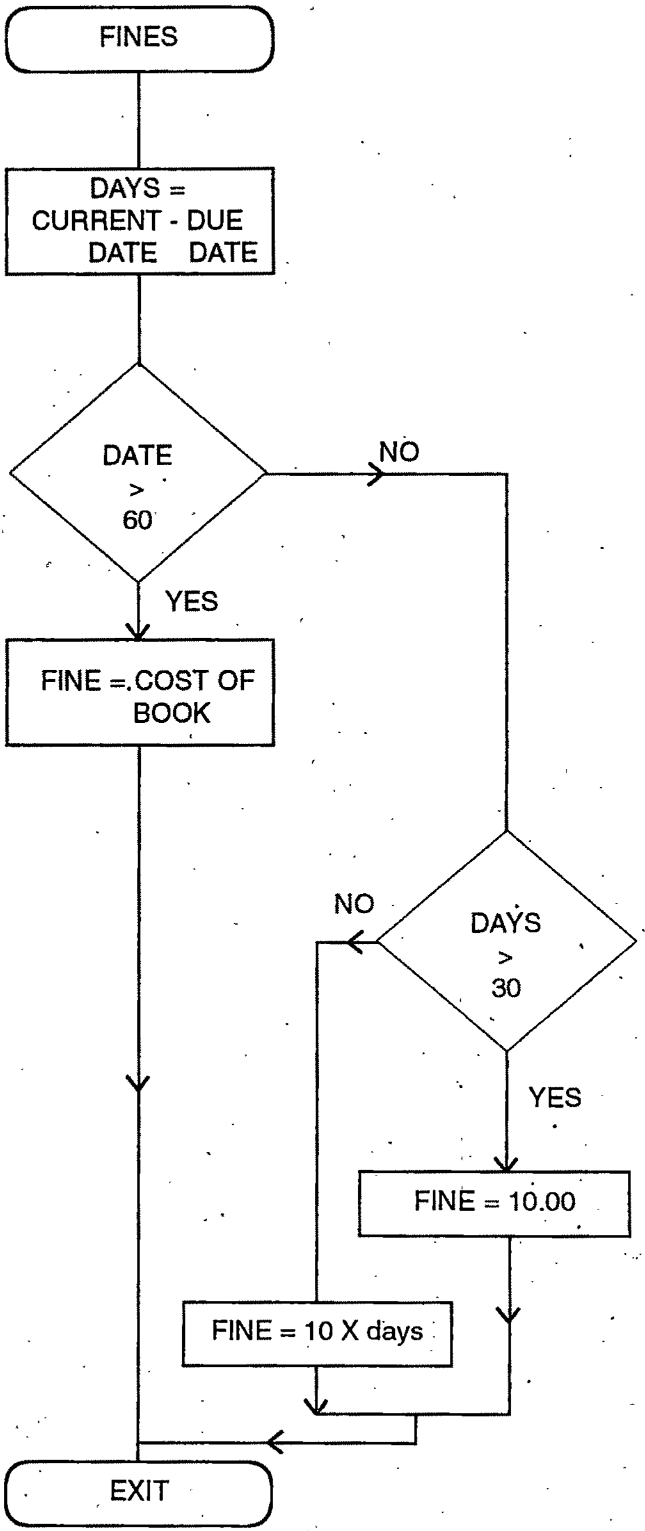
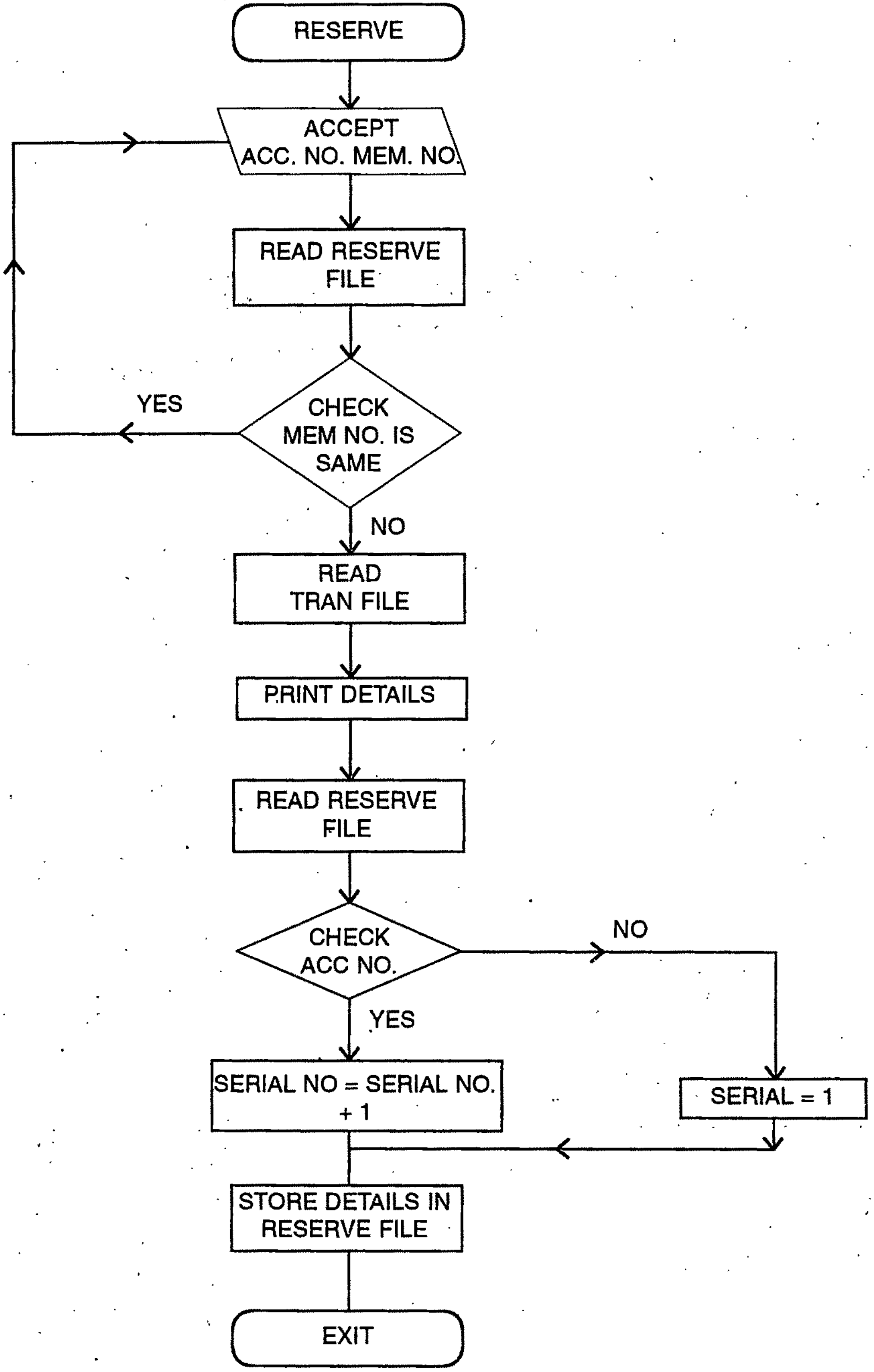


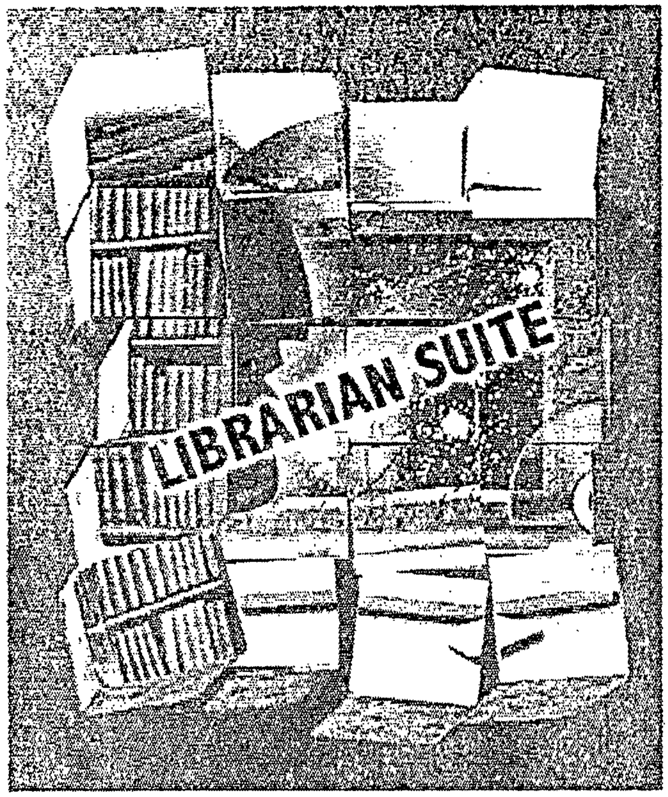
CHART OF DISCHARGING PROGRAM



FLOW CHART SHOWING CALCULATION OF FINES



FLOW CHART OF RESERVATION PROGRAM



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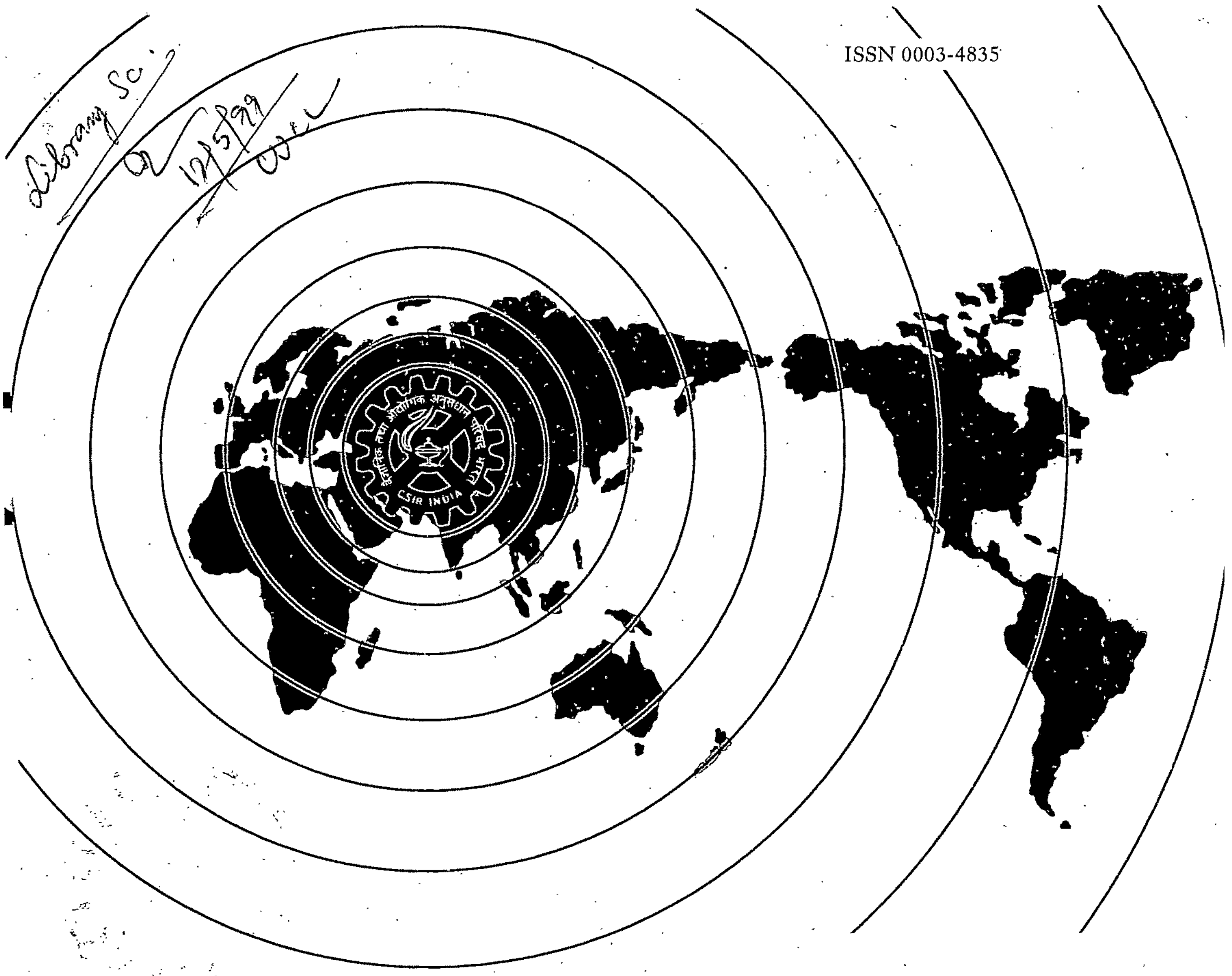

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OPTICAL STORAGE MEDIA: CD-ROM

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Deals with Optical Storage Media that includes: read-only optical discs, write-once-read many optical discs and erasable optical discs. Defines the concept of Optical Storage and describes the physical character of optical disc and its characteristics in terms of durability, high storage and portability. Read-only optical discs are discussed in detail. Highlights the CD-ROM discs, their physical character and manufacturing process. Discusses the manufacturing processes that include premastering, mastering and replication with merits and demerits in detail. Highlights some standards of Compact Disc-Interactive (CD-I) and Compact Disc-Read-Only Memory Extended Architecture (CD-ROM XA) used for accomodating multimedia information on a compact disc. Explains the characteristics of WORM discs and erasable optical discs, their manufacturing process and merits and demerits over hard discs.

The current era has acquired the name of 'information era'. The new technologies have accelerated the research and development and lead to 'information explosion'. This in turn has made impact on storage, retrieval and dissemination of information. Due to this exponential growth of information and information sources, the print media is becoming obsolete and the media for information storage are fast changing in a fascinating manner.

Some of the storage media are:

- Print Media (Paper, metal sheets etc.)
- Film Media (Microfilm, microfiche etc.)
- Magnetic Media (Magnetic tape, disc, drum etc.)
- Electronic Media (Floppy disc, hard discs etc.)
- Optical Media (CD-ROM, Video disc, CD-WORM, CD-I etc.)

The above trend shows that optical media is the latest development in the field of storage media. In this media, the data is stored on an optical disc, the surface of which is coated with magnetic material. Other storage medium such as tapes, floppies etc. are based on the principle of magnetism whereas optical media is based on the use of light (optics), i.e. laser beams (light) are used for recording and reviewing the data from the discs, that's why this media is termed as optical media. Optical discs have high storage capacity as compared to more established magnetic media. An optical disc with 4.72 inch diameter can store 600 MB information (= 30,0000 pages of text). On a single CD-ROM disc entire text of 30 Volume *Encyclopaedia Britannica* can be stored. In an optical disc, video information, graphics, music, speech, computer programmes, textual data can co-exist on a single disc and can be accessed simultaneously [1] [2].

OPTICAL DISCS

An optical disc is relatively inexpensive and has a life span of about 10-50 years. Its high storage capacity makes it appropriate not only for storing relatively large data but also the full text of the documents and images, graphics and video images as well as sound.

Broadly optical discs can be grouped into 3 categories:

1. Read-only Optical Discs
2. Write-once read many Optical Discs
3. Erasable Optical Discs

READ-ONLY OPTICAL DISCS

In this type of optical discs, the information or data is recorded by the manufacturers and the end user receives only a read only disc, that is played in a player in order to read the textual data, audio, video information that has been recorded on the disc. Nothing can be written (added) or removed on this type of discs. There are different kinds of read-only discs which have found wide applications.

a) Video discs

These discs were developed for the distribution of pre-recorded videos. Hybrid video discs store different types of information on a single disc including text data, and high quality video. One side of the video disc can store or hold about 1/2 hour movie pictures or programmes. Lack of standards and high cost of hardware has restricted their adaptation.

Digital Video Interactive (DV-I)

It integrates both audio and video. With DV-I, full motion pictures could be stored on a CD. DV-I is expected to store around one hour worth of motion picture on one disc. DV-I is being developed as a computer peripheral, rather than as a part of consumer electronic products.

b) Compact Discs

CDs are very popular consumer products in the market as audio playback. They were designed to store huge amount of data and to provide high facility of sound using a digital recording technique. Since its introduction, CDs have become popular at an extremely rapid rate and discs are widely available from a number of manufactures. Some recognised CDs are CD-Digital Audio (CDDA), CD-Read only memory (CD-ROM), CD-ROM extended Architecture (CD-ROM XA), CD-Recordable (CD-R) and CD-Interactive (CD-I).

CDDA

In CDDA, information is coded and stored on the disc in digital form, but at playback stage this gets converted into analog form and the audio signals are played back using amplifiers [3] [4].

Comapct Disc - Read-Only Memory (CD-ROM)

CD-ROM is the most popular and widely accepted optical media. It is recorded as an exciting new technology for data storage and retrieval. It is an optical disc of 120 mm with a hole of 15 mm at the centre with thickness of 12 mm. The discs have spiral tracks divided into sectors and frames. The physical standard and data format of CD-ROMs are defined by the Yellow Books (standard). Read-only memory means that the data is permanently stored or coded on the disc and it can not be added to, erased, rewritten or altered. So users can only read the disc but can not write on it, nor can erase anything written on it. The data is recorded in digital form using laser beams. The stored information can be read only by using a computer and appropriate software [5].

CD-ROM XA

This format of compact discs have both audio and video capabilities. It was designed to accomodate multimedia information on a compact disc. This standard format allows CD-I and CD-ROM discs to be used on either type of disc player.

CD-Interactive

CD-Interactive was developed for the interactive applications that ran on a stand-alone player. In this disc, audio and video information are recorded in addition to graphics and data in an integrated manner and used as such. In this, audio signals are played back using amplifiers.

CD-ROM MANUFACTURING PROCESS

The manufacturing process of CD-ROM discs consists of three steps:

i) Pre-mastering process
ii) Mastering process
iii) Replication process

i) Pre-mastering process

This process involves the input data preparation and application software development to generate the required pre-master CD-tape. With the help of database management system (DBMS) the data is prepared in a particular format suitable for the retrieval software. For instance, if the data is tabular, then tabular data structure has to be developed with the help of DBMS. In this process, first the data in required format is stored on a magnetic tape, this data is then transferred into a CD-ROM master tape which is normally a U-MATIC or EXABYTE-tape. This tape is then fed into a minicomputer which drives the mastering process.

ii) Mastering Process

This process consists of transferring data from CD-tape to a thin reflective surface of the master disc. The disc has a spiral track divided into a number of sectors. The total length of the spiral track is about 5 km. For recording the data on disc "Constant Linear Velocity" (CLV) method is used in which the linear velocity of the rotating disc remains constant to the read/write head due to which the disc rotates faster when read/write head is on the inner tracks compared with the outer tracks. Resultant large data can be stored on the outer tracks.

To encode information on disc, a laser writing machine (code cutter controlled by minicomputer) is used to produce a lanquer coating glass master disc. The density of the laser beam required for recording the data is 25mw. The laser beam is switched on and off according to the codified information on the computer tape. On receiving signals, the laser beam aimed at blank rotating master disc vaporises microscopic portion to form tiny holes called PITS. The absence of signals leaves the surface intact. On the disc surface, the data is stored as a series of PITS (data) and LANDS (No data) which corresponds to magnetised and non-magnetised digital data. The width of a PIT is 0.6 microns and the distance between two tracks is 1.6 microns. The information is stored on the spiral track of disc consisting of tiny PITS in the lanquer. The glass master disc is then coated with nickel to obtain Nickel Stamper which has all the information of the original glass master. This metal stamper is used in the next step to stamp out replicas.

iii) Replication Process

The raw material for this process is transparent polycarbonate MACROLON (trade name) resion, the granules of which are dried with hot air. The metal stamper (Al stamper for CD-audio and Ni stamper for CD-ROMs), are then inserted in the injecting moulding machine cavity into which the

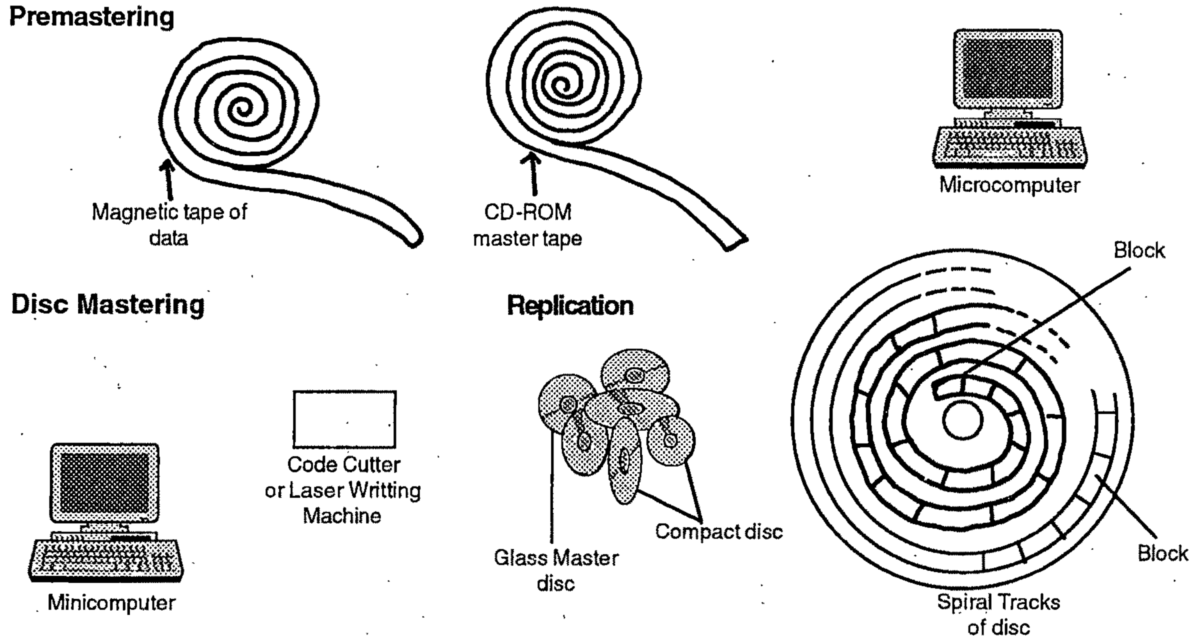

Fig. 1 : CD-ROM Manufacturing Process

polycarbonate granules are injected under high pressure and heated upto 300°C. The temperature is lowered and the polycarbonate with desired PITS formed on it are taken to the sputting cavity for vacuum metalisation. The metal vapours provide the reflective Al or Ni coating. To protect the CD from contamination and surface damage, clear lanquer coating is applied by spin coating process. After further cleaning, the label printing is done on the back of the disc giving information about the contents [6] [7].

CD-ROM eventually has become a new tool for storage, retrieval and distribution of vast data or information. CD-ROM discs have spiral tracks which are divided into a number of sectors. Each sector or block on CD-ROM disc actually contains some 98 CD-frames, each of 24 bytes to give a total sector capacity of 2352 bytes of which 2048 bytes are always for user data and remaining 304 bytes are used for the codification purpose. The codes are appended to the front and back of the user data. These codes consist of header, synchronisation, error detection and error correction bytes and the bytes that drives need to locate data on disc, as illustrated below:

Synchronisation field	-	12	bytes
Header field	-	04	bytes
User data	-	2048	bytes
Auxillary data	-	288	bytes
TOTAL	**-**	**2352**	**bytes**

To Read The Data

For reading the data from the disc, a lower density (5 mw) laser beam is used. The data is stored on the surface as a series of PITS and LANDS of variable length. A PIT is a small dent (0.6 micron) and LAND is the surface between PITS. In operation, when laser beam of lower density focuses on the rotating surface, the PITS scatter the laser beam and the LANDS reflect it. The direction and amount of reflected light changes as the surface changes from LANDS to a PITS and vice versa. These changes in the light are detected by the reading head (photo-detector) and give CD-drive to read data. The CD-ROM reading head does not get close to the disc as in the case of magnetic read/write head. Hence the chance of the head crashing into the disc is virtually zero [8].

Comparison with Magnetic Disc

The comparison of a CD-ROM Disc with a hard disc [8] is given below:

	CD-ROM		Hard Disc	
Capacity	600	Mb	10-40	Mb
Number of tracks	18,000		612	
Average Seek	500	ms	100	ms
Rotational Speed	300-600	rpm	3600	rpm
Average latency	100	ms	8.3	ms
Transfer rate	150	mb/ sec	96	kb/ sec

Application and Use of CD-ROMs

The enormous data capacity of CD-ROM makes it ideal for a wide range of applications [9] [10] from publishing to database as given below:

(i) as archives i.e. for the storage of archival material

(ii) for distribution, provides a cost effective medium for distributing large quantity of data. They are portable and can be easily posted;

(iii) as reference material

Publishing large amount of data like encyclopaedias and other voluminous reference information is one of the prime applications of CD-ROMS. Some voluminous reference information can be accessed by online systems too.

(iv) as an interactive medium e.g. used for arcode games and education. Now CD-ROM has been used as an alternative method for publishing the training manuals, compound documents having bit mapped images with graphics and documents having information about games and courses.

Other areas where CD-ROM is being used are as follows:

Medical	: for creating drugs database
Law	: for publishing government rules, regulations
Financial	: for publishing corporate financial information and budgets
Manufacturing	: for publishing parts inventory
Aerospace	: for publishing the drawing information

Advantages of CD-ROM Discs

CD-ROM discs have a lot of advantages [11] [12].

These are:

a) High Storage Capacity

CD-ROM discs have tremendous storage capacity (600 Mb or 570 billion alphanumeric characters) as compared to magnetic storage media.

b) Multimedia Capacity

CD-ROM discs have multimedia capacity as different types of data viz. conventional text and numeric data with audio, computer graphics, video or digited photographic images can coexist on a single CD-ROM disc. These data can be accessed simultaneously which is not possible with other storage media [13].

c) Enhanced Retrieval Capabilities

It offers powerful method of information retrieval such as free text, controlled vocabulary searching and combining of concepts through boolean logic. Some CDs provide menu-driven access for the novice and command-driven for the experienced searchers.

d) Easy and Unlimited Access

CD-ROM products provide an easy and unlimited access to the stored information as and when needed. The disc can be used repeatedly and allow unlimited access to the information similar to books.

e) PCs and CD-ROM

CD-ROM is a powerful peripheral for personal computers and with the use of CD-drives, PCs can be transformed into a very powerful information resource. A convenient way of database searching can be obtained by combining PCs and CD-ROMs.

f) Controlled Cost

The cost of manufacturing discs and their distribution is low as compared to the amount of data it stores. The expensive access to large mainframe systems can be diminished by using CD-ROM data base on PCs. The cost of CD-ROMs are independent of the amount of searching time.

g) Portability and Durability

CD-ROMs being small in size, are easily portable and have high durability i.e. their storage life is about 10-50 years.

h) Psychological Advantage

Searching on CD-ROM has a definite psychological advantage because the users are free from time pressure, they can try various strategies to obtain optimum results and there is no financial penulty for commiting mistakes.

i) Data Protection

On CD-ROMs it is possible to maintain the integrity, purity and permanance of data since there is no chance of accidental data erasure, head crash and any wear and tear because the R/W head does not touch the surface of the disc.

j) Easy Storage

Like a floppy it can be removed from the drive giving it mobility.

Disadvantages of CD-ROMs

Besides a lot of advantages, the CD-ROMs have following disadvantages.

a) Limited searching

Its main disadvantage is longer access time as compared to hard discs and online searching.

Response rate is also very slow. Only one user can access a CD-ROM at one time so others have to wait for their turn [14].

b) Read-Only Device

Since it is a read-only device (i.e. data is stored permanently), the currency of information can not be maintained.

c) Lack of Standardisation

It is a major barrier of CD-ROM. Standardisation is essential for the flexibility. Through standardisation, hardware and software incapabilities and differences in operating procedures can be minimised.

WRITE ONCE READ MANY (WORM) OPTICAL DISCS

As we know that CD-ROM stores information permanently, we can not erase the data written on it and can not re-record anything. The data or information on disc are coded by the manufacturers. Therefore, for inhouse archiving of data, CD-WORM was invented. It is also sometimes referred to as Direct Read After Write (DRAW). It is an optical (compact) disc on which user can record the data once and read as many times as desired. CD-WORM discs are used for inhouse archiving of data that an organisation may wish to store and consult data but not amend. Once the data is stored, a user can not erase the written data or re-record on it.

The manufacturing process of CD-WORM is almost similar to CD-ROM disc production and writing data. CD-WORM disc's tracks are concentric circles having a number of sectors, instead of spiral tracks of CD-ROM discs. The laser beam used for writing data is of modest density forming PITS or bubbles on the surface of the disc. Here also digital data is recorded in the form of PITS and LANDS. For reading the PITS, the density of the laser beam is less than that used for writing.

It can be used for storing permanent data, information and files for maintaining records. While read-only devices are valuable for publishing in computer readable form, write once devices are suitable for preservation of valuable documents in compact storage medium. IBM has developed 200 MB WORM for its PS/2 system. WORM disc has high storage capacity, reliability and takes less time in searching as tracks rotate with constant speed. Standardisation has been a problem with WORM disc too but once the standards are established, WORM discs may be used on mainframes to provide multi-user access to a published database. Publishers may also develop image databases on WORM disc and then distribute on CD-ROM and thus CD-ROM and CD-WORM may complement one another. Its main draw back is great access time compared to that of hard discs.

ERASABLE OPTICAL DISCS

Data can be recorded, read, erased, re-recorded on erasable optical discs, so that they can be used in application where magnetic discs are currently in use and can serve as a secondary memory of computer. The tracks of the disc are concentric circles which are divided into a number of sectors. The track rotates with constant speed to make quick access.

The manufacturing process is similar to that of CD-ROM disc production using a slightly different system for writing and reading the information. The disc surface is coated with magnetic property at room temperature. A different magneto-optical system is used for writing and reading data. In this system, both the principle of magnetism and optics are involved. For recording the data on concentric track of disc surface, moving with constant speed, a laser beam together with magnetic field is used. To create magnetic field, the read/write head of laser writing machine contains a current coil which produces a perpendicular magnetic field on disc when a current is passed through it. At room temperature the created magnetic field can not magnetise any spot on disc. In writing process, first the laser beam is focussed to heat at the spot which is immediately magnetized by the applied magnetic field by current coil and a tiny vertical magnet is created on the place of spot. This tiny magnet represents the data. For reading the written data polarised laser beam is used (due to presence of magnetic field, laser beam is polarised). When a polarised laser beam is focussed on tiny magnet it is reflected from the tiny magnet due to which plane of polarisation rotates by a few degree. This change in plane of polarisation is read by the optical system. The density of laser beam used for reading is less than that used for writing. For removing the data from the disc, the data or spot to be erased (or entire data) is heated with laser beam in the absence of magnetic field (i.e. vertical magnetic field is turned off). The tiny magnet disappears in this condition.

Its advantage over hard disc are:

i) Very high storage capacity. A 5.25 inch optical disc can store about 650 mbyte of data;

ii) An optical disc can be removed from the drive;

iii) It has a long life;

iv) It is more reliable.

The drawback is its longer access time compared to that of hard discs [15, 16].

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USE OF INFORMATION SOURCES VERSUS THE PERSONAL ATTRIBUTES OF BIOLOGICAL SCIENTISTS IN A UNIVERSITY ENVIRONMENT IN INDIA: A CASE STUDY OF KARNATAK UNIVERSITY, DHARWAD

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Studies the relative importance of information sources among the biological scientists and on the basis of statistical tests concludes that the personal attributes of biological scientists such as designation, experience and nature of research in a university environment have bearing on the use of information sources.

INTRODUCTION

Information required by the scientists is available in a variety of information sources. Although, no way of classifying them is found satisfactory and the groups are neither exhaustive nor mutually exclusive but for convenience, they can be grouped into formal sources of information. Even though, a considerable amount of research has been done on the use of information sources among the scientists, engineers and technologists, a large chunk of it is concentrated on the studies relating to the relative importance and the dependence on the formal sources of information. In order to develop the information resources to meet the needs of the users of libraries, the information professionals concerned with the development of collection of information materials must find answers to the following questions: What information sources are required and used by the users? How the use of different sources of information varies with the functional responsibilities of users? What are the factors which decide the choice of a particular source of information? How characteristics affect the use of different sources of information? How user characteristics affect the use of different sources of information?

In the present study, an attempt has been made not only to identify the relative importance of different sources of information used by the scientists but also to test whether the personal attributes of biological scientists have any bearing on the use of information sources or not.

OBJECTIVES

The twin objectives of the present study are to determine the relative use of information sources, and the use of information sources versus the personal attributes of biological scientists in a university environment. Specifically, the objectives of the study are to:

a) determine the relative importance of different sources of information; and

b) to know whether the personal attributes of biological scientists such as designation, qualifications, sex, age, experience, nature of work and nature of research in a university environment have any bearing on the use of information sources or not.

HYPOTHESIS

For the purpose of this study, the following hypothesis has been formulated.

The personal attributes of biological scientists such as designation, qualifications, sex, age, experience, nature of work and nature of research in a university environment have no bearing on the use of information sources.

---

*Professor and chairman

METHODOLOGY AND STUDY POPULATION

The sources of information used by scientists can be studied by enquiring from the scientists about it, observation, or by examining their publications. For this study, the first approach is adopted, where in the survey method has been followed for the collection of data required for the study. The questionnaire was designed consisting of two parts. Part-I is concerned with eliciting the information regarding the personal attributes such as designation, subject, qualifications, sex, age, experience (teaching and research), nature of work, nature of research and the number of publications, while the Part-II consisting of twenty six different sources of information was constructed keeping in view the objectives and hypothesis of the study (Appendix-I). The respondents were asked to rate the frequency of use of each one of these sources of information on a five point scale of 0 to 4, where 4 stands for 'most frequently used', 3 for 'frequently used', 2 for 'occasionally used', 1 for 'rarely used', and 0 for 'never used'. The mean use score for each one of the sources has been calculated by multiplying the raw score with the corresponding value of the five point scale and sum of it is divided by N i.e., number of respondents.

The study population consisted of members of faculty and research scholars of the departments of botany, zoology and biochemistry (part of chemistry) of Karnatak University Campus, Dharwad. A total of fifty three scientists were working in these departments and the questionnaire designed for the purpose was distributed to all of them. Out of which, forty eight responded to our request with a response rate of 90.57%. The data collected through the questionaire was further tabulated and statistical tests such as Spearman's rank correlation coefficient (r) and Kendal's Coefficient of Concordance (W) were applied to test the hypothesis and for results and discusion. The Spearman rank-difference method symbolized by r (read as rho) for computing the correlation coefficient between two sets of ranks or between two sets of scores converted into ranks. The formula is:

$$r = 1 - \frac{6\sum D^2}{N(N^2-1)}$$

where r = Spearman's rank correlation coefficient,
D = difference between rank_1 and rank_2 and;
N = Number of pairs of ranks/scores.

The Kendal's Coefficient of Concordance symbolized by letter W is a measure of correlation between more than two sets of ranks. The equation used for computing W is:

$$W = \frac{S}{1/12\, K^2\, (N^3-N)}$$

Where,

W = Coefficient of Correlation;
S = Sum of Squares deviations from the mean r_j;
K = Sets of rankings; and
N = Number of Sources which have been ranked

When the $N > 7$ the significance of W is tested by converting its values into Chisquare with the help of the following formula:

$X^2 = K(N-1)W$ and

the degrees of freedom (df) is always equal to (N-1) and Chisquare calculated value is compared with the Chisquare table value at 0.05 level of significance. If the Chisquare calculated value exceeds the table value, then the value of W is significant and the null hypothesis is rejected.

RESULTS AND DISCUSSION

Characteristics of study population

The study population consisted of more number of research scholars (45.83%) than readers (41.67%) and lecturers (12.50%) (Table 1). Majority of the scientists were from the field of botany (41.67%) and the rest from zoology (35.42%) and biochemistry (22.92%) (Table 2). Fifty percent of the scientists were Ph. D holders (Table 3), while more than three-fourth (79.17%) consisted of male population (Table 4). More than half of the scientists belonged to the age group of below 35 years and followed by those more than 46 years (31.25%) and 36-45 years (14.58%)

(Table 5). Teaching and research experience of scientists showed that one-forth of them belonged to the initial phase, while 41.67%, 33.33% respectively belonged to the middle and later phases (Table 6). Half of the scientists were engaged in teaching and research, while one scientist only in teaching (Table 7). Nearly 40% of the scientists studied were conducting basic research, the applied research being carried out by 27.08%, while the remaining 33.33% of the scientists were involved in both types of research (Table 8). Approximately 37.50% of the scientists

Table 1

Designationwise Distribution of Biological Scientists in a University Environment (N=48)

Designation	Number	%
Professors	-	-
Readers	20	41.67
Lecturers	6	12.50
Research Scholars	22	45.83
Total	48	100.00

Table 2

Subjectwise Distribution of Biological Scientists in a University Environment (N=48)

Subject	Number	%
Botany	20	41.87
Zoology	17	35.42
Biochemistry	11	22.92
Total	48	100.00

Table 3

Qualification Distribution of Biological Scientists in a University Environment (N=48)

Qualification	Number	%
Ph.D	24	50.00
Non-Ph.D	24	50.00
Total	48	100.00

Table 4

Sexwise Distribution of Biological Scientists in a University Environment (N=48)

Sex	Number	%
Male	38	79.17
Female	10	20.83
Total	48	100.00

Table 5

Agewise Distribution of Biological Scientists in a University Environment (N=48)

Age (In Years)	Number	%
<35	26	54.17
36-45	7	14.58
46>	15	31.25
Total	48	100.00

Table 6

Teaching and Research Experience of Biological Scientists in a University Environment (N=48)

Experience	Number	%
Initial Phase	12	25.00
Middle Phase	20	41.67
Later Phase	16	33.33
Total	48	100.00

Table 7

Nature of Work Performed by the Biological Scientists in a University Environment (N=48)

Nature of Work	Number	%
Teaching	1	2.08
Research	23	47.92
Both	24	50.00
Total	48	100

Table 8

Research Work Undertaken by Biological Scientists in a University Environment (N=48)

Nature of Research Work	Number	%
Basic Research	19	39.58
Applied Research	13	27.08
Both	16	33.33
Total	48	99.99

Table 9

Publicationwise Distribution of Biological Scientists in a University Environment: With vs Without Publications (N=48)

Number	Journal Articles	Seminar Papers	Review Articles	Books	Book Reviews
Without	18(37.50)	17(35.42)	40(83.33)	44(91.67)	48(100)
With	30(62.50)	31 (64.58)	8(16.66)	4(8.33)	-
	@ = 6.59	@ = 3.28	@ = 1	@ = 0.89	

were not having any journal articles to their credit. Similarly 35.42%, 83.33% and 91.67% of scientists respectively were not having any seminar/conference papers, review articles and books to their credit. Not even one scientists had book review/s to his credit. Among the scientists who were having publications to their credit, 16.67% were having 1-5 journals articles and seminar papers ranging between 1-5 accounted by one fourth of the scientists (Table 9).

Use of Information Sources by the Biological Scientists

The use of different sources of information by the biological scientists in a university environment is shown in Table 10. Reprints/preprints (70.83%), abstracting and Indexing journals (64.58%), primary periodicals (54.17%), research reports (39.58), and subject bibliographies (31.25%), were the sources of information which were most frequently used by the largest majority of the biological scientists. Monographs/Textbooks (45.83%), library catalogs (31.25%) and newspapers (27.08%) were frequently used sources of information, while dictionaries (45.83%), personal contacts (41.67%), conference/seminar papers (37.50%), yearbooks and directories (35.42%), encyclopedias (35.50%), theses and dissertations (31.25%), handbooks and manuals and institutional sources (27.08% each) were the sources of information which were occasionally used by the biological scientists. Yearbooks and directories (35.42%), library personnel (31.25%), government publications (29.17%), were rarely used, while standards (70.83%), patents (66.67%), private files (54.17%), trade catalogs (47.92%), geographical sources (47.93%), audio-visual sources (41.67%), bibliography of bibliographies (37.50%), guides to subject literature (35.42%), and government publications (29.17%) were never used by majority of the biological scientists in a university environment. The mean use score and the ranking of different sources of information used by the biological scientists indicated that the reprints/

Table 10

Use of Information Sources by the Biological Scientists in a University Environment (N=48)

Information Sources	Most Frequently Used	Frequently Used	Occasionally Used	Rarely Used	Never Used	Mean Use Score (Rank)
	4	3	2	1	0	
Primary Journals	26 (54.17)	11 (22.92)	10 (20.83)	-	1 (2.08)	3.27 (3)
Research Reports	19 (39.58)	17 (35.42)	4 (8.33)	6 (12.50)	2 (4.17)	2.94 (4)
Conference/Seminar Papers	10 (20.83)	13 (27.08)	18 (37.50)	6 (12.50)	1 (2.08)	2.52 (6)
Patents	1 (2.08)	2 (4.17)	8 (16.67)	5 (10.42)	32 (66.67)	1.38 (20)
Standards	2 (4.17)	3 (6.25)	8 (16.67)	1 (2.08)	34 (70.83)	0.71 (26)
Trade Catalogues	29 (4.17)	3 (6.25)	9 (18.75)	11 (22.92)	23 (47.92)	0.96 (24)
Theses and Dissertations	7 (14.58)	12 (25.00)	15 (31.25)	8 (16.67)	6 (12.50)	2.13 (10)
Personal Contacts	5 (10.42)	10 (20.83)	20 (41.67)	7 (14.58)	6 (12.50)	2.02 (11)
Private Files	5 (10.42)	3 (6.25)	4 (8.33)	10 (20.83)	26 (54.17)	0.98 (23)
Newspapers	10 (20.83)	13 (27.08)	9 (18.75)	9 (18.75)	7 (14.58)	2.21 (9)
Govt Publications	-	10 (20.83)	10 (20.83)	14 (29.17)	14 (29.17)	1.13 (21)
Reprints/Preprints	34 (70.83)	10 (20.83)	4 (8.33)	-	-	3.63 (1)

contd.

table 10 (contn.)

Information Sources	Most Frequently Used	Frequently Used	Occasionally Used	Rarely Used	Never Used	Mean Use Score (Rank)
	4	3	2	1	0	
Abstracting and Indexing Journals	31 (64.58)	9(18.75)	1 (2.08)	5 (10.42)	2 (4.17)	3.29 (2)
Subject Bibliographies	15 (31.25)	11 (22.92)	9 (18.75)	7 (14.58)	6 (12.50)	2.46 (7)
Monographs/Textbooks	12 (25.00)	22 (45.83)	8 (16.67)	4 (8.33)	2 (4.17)	2.79 (5)
Dictionaries	7 (14.58)	9 (18.75)	22 (45.83)	8 (16.67)	2 (4.17)	2.23 (8)
Encyclopedias	2 (4.17)	14 (29.17)	17 (35.42)	9 (18.75)	6 (12.50)	1.94 (12)
Yearbooks & Directories	3 (6.25)	3 (6.25)	17 (35.42)	17 (35.42)	8 (16.67)	1.50 (19)
Geographical Sources	1 (2.08)	1 (2.08)	10 (20.83)	13 (27.08)	23 (47.92)	0.83 (25)
Handbooks and Manuals	2 (4.17)	12 (25.00)	13 (27.08)	1 (22.92)	10 (20.83)	1.69 (16)
Library Catalogue/s	3 (6.25)	15 (31.25)	10 (20.83)	12 (25.00)	8 (16.67)	1.85 (14)
Bibliography of Bibliographies	1 (2.08)	7 (14.58)	8 (16.67)	14 (29.17)	18 (37.50)	1.67 (17)
Guides to Subject Literature	7 (14.58)	13 (27.08)	6 (12.50)	5 (10.42)	17 (35.42)	1.75 (15)
Institutional Sources	8 (16.67)	7 (14.58)	13 (27.08)	11 (22.92)	9 (18.75)	1.88 (13)
Audio-visual Sources	2 (4.17)	4 (8.33)	7 (14.58)	15 (31.25)	20 (41.67)	1.02 (22)
Library Personnel	4 (8.33)	8 (16.67)	11 (22.92)	15 (31.25)	10 (20.83)	1.60 (18)

preprints were the most useful sources of information and these were followed by abstracting and indexing journals, primary journals, research reports, monographs/textbooks, conference/seminar papers, dictionaries, newspapers, theses and dissertations, encyclopedias, institutional sources, library catalogues, guides to subject literature, handbooks and manuals, bibliography of bibliographies, library personnel, yearbooks and directories, patents, government publications, audio-visual sources, private files, trade catalogues, geographical sources and standards.

Use of Information Sources vs the Personal Attributes of Biological Scientists

The use of information sources among the biological scientists in a university environment was further examined to determine whether the personal attributes of biological scientists have any bearing on the use of information sources or not.Table 11 shows the mean use score and the rank ordering of sources of information among the biological scientists versus their designation. The Kendal's computed coefficient of concordance ($W=0.538$; $X^2=40.35$; $X_{\propto}^2=38.8$;$df=26$; $\propto=0.05$) showed that there was a significant relationship as to the rank ordering of different sources of information used by the biological scientists versus their designation. The mean use score and the rank ordering of the different sources of information used by the biological scientists by their qualifications viz PH.D's and Non-Ph.D's is shown in Table 12. The Spearman's rank order correlation coefficient ($r=0.8723$; $P<P.0001$; $\propto=0.05$) indicated that there was a significant agreement among the Ph. D's and Non-Ph.D's as far as the use of different sources of information among the biological scientists was concernd. Table 13 shows the mean use score and rank ordering of sources of information among the biological scientists by their sex. The Spearman's rank order correlation coefficient ($r=0.9381$; $P<0.0001$; $\propto=0.05$) confirmed an extremely significant agreement among the biological scientists as with regard to the use of information sources versus sex. Table 14 shows the mean use score and the rank

Table 11

Use of Information Sources by the Biological Scientists in a University Environment: Designation

Information Sources	Professors(N=0) Mean Use Score(Rank)	Readers(N=20) Mean Use Score(Rank)		Lectures(N=6) Mean Use Score(Rank)		Research Scholars (N=22) Mean Use Score(Rank)	
Primary Journals	-	3.45	(2)	3.17	(4)	3.18	(2)
Research Reports	-	2.75	(6)	3.17	(4)	3.00	(4)
Conference/Seminar Papers	-	3.15	(4)	2.00	(10)	2.09	(9)
Patents	-	0.55	(22)	1.17	(13)	0.50	(24)
Standards	-	0.40	(23)	0.83	(15)	1.05	(19)
Trade Catalogues	-	0.9	(20)	1.00	(14)	0.95	(20)
Theses and Dissertations	-	2.1	(8)	2.17	(9)	2.5	(7)
Personal Contacts	-	2.1	(8)	2.83	(6)	1.73	(13)
Private Files	-	0.75	(21)	1.83	(11)	0.86	(21)
Newspapers	-	1.85	(10)	2.67	(7)	2.23	(8)
Govt Publications	-	1.55	(13)	1.5	(12)	1.36	(18)
Reprints/Preprints	-	3.7	(1)	3.83	(1)	3.35	(1)
Abstracting and Indexing Journals	-	3.4	(3)	3.00	(5)	3.14	(3)
Subject Bibliographies	-	2.5	(7)	3.67	(2)	2.00	(10)
Monographs/Textbooks	-	3.0	(5)	3.5	(3)	2.64	(6)
Dictionaries	-	2.1	(8)	3.17	(4)	2.68	(5)
Encyclopedias	-	1.85	(10)	2.67	(7)	1.91	(11)
Yearbooks & Directories	-	1.3	(16)	1.83	(11)	1.45	(17)
Geographical Sources	-	0.95	(19)	0.33	(16)	0.64	(23)
Handbooks and Manuals	-	1.65	(12)	2.67	(7)	1.55	(16)
Library Catalogue/s	-	1.75	(11)	3.17	(4)	1.77	(12)
Bibliography of Bibliographies	-	1.25	(17)	2.67	(7)	0.68	(22)
Guides to Subject Literature	- -	1.45	(14)	2.83	(6)	1.73	(13)
Institutional Sources	-	1.95	(9)	2.33	(8)	1.68	(14)
Audio-visual Sources	-	1.2	(18)	0.83	(15)	0.68	(22)
Library Personnel	-	1.4	(15)	2.0	(10)	1.64	(15)

W = 0.538; X^2 = 40.35; X_α^2 = 38.8; df =26; ∝ = 0.05

Table 12

Use of Information Sources by the Biological Scientists in a University Environment: Ph.D vs Non-Ph.D

Information Sources	Ph.D.(N=24) Mean Use Score (Rank)		Non-Ph.D (N=24) Mean Use Score (Rank)	
Primary Journals	3.45	(2)	3.08	(2)
Research Reports	2.96	(3)	3.00	(4)
Conference/Seminar Papers	2.83	(5)	2.25	(7)
Patents	0.58	(21)	0.63	(21)
Standards	0.33	(22)	1.17	(16)
Trade Catalogues	0.96	(19)	0.83	(18)
Theses and Dissertations	2.04	(9)	2.54	(6)
Personal Contacts	2.33	(6)	1.83	(10)
Private Files	0.91	(20)	0.88	(17)
Newspapers	1.96	(11)	2.25	(7)
Govt Publications	1.17	(17)	1.46	(15)
Reprints/Preprints	3.58	(1)	3.36	(1)
Abstracting and Indexing Journals	3.45	(2)	3.04	(3)
Subject Bibliographies	2.88	(4)	1.96	(9)
Monographs/Textbooks	2.33	(6)	2.67	(5)
Dictionaries	2.29	(7)	2.13	(8)
Encyclopedias	2.00	(10)	1.96	(9)
Yearbooks & Directories	1.33	(15)	1.54	(14)
Geographical Sources	1.25	(16)	0.67	(20)
Handbooks and Manuals	2.08	(8)	1.46	(15)
Library Catalogue/s	2.08	(8)	1.79	(11)
Bibliography of Bibliographies	1.54	(13)	0.79	(19)
Guides to Subject Literature	1.71	(12)	1.79	(11)
Institutional Sources	2.00	(10)	1.75	(12)
Audio-visual Sources	1.08	(18)	0.79	(19)
Library Personnel	1.42	(14)	1.71	(13)

$r = 0.8723$; $P < 0.0001$ (two tailed); P Value Summary = Extremely Significant $\alpha = 0.05$

Table 13

Use of Information Sources by the Biological Scientists in a University Environment : Male vs Female

Information Sources	Male (N=38) Mean Use Score (Rank)		Female (N=10) Mean Use Score (Rank)	
Primary Journals	3.34	(3)	3.1	(3)
Research Reports	2.92	(5)	3.2	(2)
Conference/Seminar Papers	2.58	(6)	2.3	(10)
Patents	0.53	(25)	0.90	(17)
Standards	0.71	(24)	0.90	(17)
Trade Catalogues	0.95	(20)	0.90	(17)
Theses and Dissertations	2.26	(8)	3.00	(4)
Personal Contacts	2.03	(10)	2.00	(13)
Private Files	0.92	(21)	0.80	(18)
Newspapers	2.11	(9)	2.6	(7)
Govt Publications	1.39	(17)	1.40	(15)
Reprints/Preprints	3.66	(1)	3.6	(1)
Abstracting and Indexing Journals	3.32	(4)	2.7	(6)
Subject Bibliographies	2.42	(7)	2.4	(9)
Monographs/Textbooks	3.39	(2)	2.9	(5)
Dictionaries	2.11	(9)	2.5	(8)
Encyclopedias	1.87	(11)	2.4	(9)
Yearbooks & Directories	1.29	(18)	2.0	(13)
Geographical Sources	0.79	(23)	0.40	(19)
Handbooks and Manuals	1.66	(15)	2.1	(12)
Library Catalogue/s	1.82	(12)	2.4	(9)
Bibliography of Bibliographies	1.16	(19)	1.2	(16)
Guides to Subject Literature	1.71	(14)	2.2	(11)
Institutional Sources	1.76	(13)	2.2	(11)
Audio-visual Sources	0.89	(22)	0.90	(17)
Library Personnel	1.53	(16)	1.6	(14)

$r=0.9381$; $P< 0.0001$ (two tailed); P Value Summary = Extremely Signigicant $\propto= 0.05$

Table 14

Use of Information Sources by the Biological Scientists in a University Environment : Age

Information Sources	<35 (N=26) Mean Use Score(Rank)	36-45 (N=7) Mean Use Score (Rank)	46> (N=15) Mean Use Score(Rank)
Primary Journals	3.19 (2)	3.71 (3)	3.27 (2)
Research Reports	2.96 (4)	3.71 (3)	2.67 (5)
Conference/Seminar Papers	2.07 (9)	3.14 (4)	3.00 (4)
Patents	0.62 (21)	0.86 (16)	0.47 (19)
Standards	1.00 (18)	0.71 (17)	0.33 (20)
Trade Catalogues	1.00 (18)	1.28 (14)	0.60 (18)
Theses and Dissertations	2.46 (6)	2.28 (8)	2.00 (8)
Personal Contacts	1.92 (12)	2.57 (6)	1.93 (9)
Private Files	1.04 (17)	1.00 (15)	0.60 (18)
Newspapers	2.27 (7)	1.86 (10)	2:07 (7)
Govt Publications	1.31 (16)	1.71 (11)	1.40 (15)
Reprints/Preprints	3.62 (1)	3.86 (2)	3.67 (1)
Abstracting and Indexing Journals	3.08 (3)	4.00 (1)	3.20 (3)
Subject Bibliographies	2.23 (8)	2.86 (5)	2.53 (6)
Monographs/Textbooks	2.69 (5)	3.14 (4)	3.00 (4)
Dictionaries	2.23 (8)	2.57 (6)	2.07 (7)
Encyclopedias	1.96 (11)	2.00 (9)	1.8 (10)
Yearbooks & Directories	1.5 (15)	1.57 (12)	1.33 (16)
Geographical Sources	0.54 (22)	1.0 (15)	1.07 (17)
Handbooks and Manuals	1.77 (13)	1.86 (10)	1.67 (11)
Library Catalogue/s	2.04 (10)	2.29 (7)	1.67 (11)
Bibliography of Bibliographies	0.96 (19)	1.00 (15)	1.6 (12)
Guides to Subject Literature	1.96 (11)	1.57 (12)	1.47 (14)
Institutional Sources	1.81 (12)	2.29 (7)	1.8 (10)
Audio-visual Sources	0.69 (20)	1.43 (13)	1.07 (17)
Library Personnel	1.73 (14)	1.00 (15)	1.53 (13)

W = 0. 492; X^2 = 34.9; X_{α}^2 = 38.88; df=26; α = 0.05

Table 15

Use of Information Sources by the Biological Scientists in a University Environment : Experience

Information Sources	Initial Phase (N=12)	Middle Phase (N=20)	Last Phase (N=16)
	Mean Use Score(Rank)	Mean Use Score(Rank)	Mean Use Score(Rank)
Primary Journals	3.25 (2)	3.5 (2)	3.06 (4)
Research Reports	2.83 (3)	3.4 (3)	2.56 (8)
Conference/Seminar Papers	2.00 (10)	2.6 (7)	2.88 (6)
Patents	0.83 (17)	0.6 (21)	0.44 (23)
Standards	1.67 (13)	0.45 (23)	0.50 (22)
Trade Catalogues	1.83 (11)	0.50 (22)	0.81 (20)
Theses and Dissertations	1.83 (11)	2.65 (6)	2.19 (9)
Personal Contacts	2.08 (9)	2.05 (11)	1.94 (12)
Private Files	1.25 (15)	0.95 (19)	0.69 (21)
Newspapers	2.00 (10)	2.00 (12)	2.63 (7)
Govt Publications	1.42 (14)	1.35 (16)	1.69 (16)
Reprints/Preprints	3.67 (1)	3.55 (1)	3.75 (1)
Abstracting and Indexing Journals	2.75 (4)	3.15 (4)	3.69 (2)
Subject Bibliographies	1.83 (11)	2.35 (8)	2.94 (5)
Monographs/Textbooks	2.33 (7)	3.00 (5)	3.19 (3)
Dictionaries	2.42 (6)	2.25 (9)	2.00 (11)
Encyclopedias	2.17 (8)	2.00 (12)	1.81 (14)
Yearbooks & Directories	1.75 (12)	1.3 (17)	1.31 (18)
Geographical Sources	1.00 (16)	0.40 (24)	0.94 (19)
Handbooks and Manuals	1.67 (13)	1.75 (13)	1.75 (15)
Library Catalogue/s	1.83 (11)	2.1 (10)	1.88 (13)
Bibliography of Bibliographies	1.25 (15)	1.00 (18)	1.31 (18)
Guides to Subject Literature	2.58 (5)	0.95 (19)	1.81 (14)
Institutional Sources	2.00 (10)	1.6 (14)	2.13 (10)
Audio-visual Sources	0.75 (8)	0.65 (20)	1.44 (17)
Library Personnel	1.42 (14)	1.45 (15)	1.81 (14)

W = 0.526; $X^2 = 39.45$; $X_{\propto}^2 = 38.8$ df = 26; $\propto = 0.05$

Table 16

Use of Information Sources by the Biological Scientists in a University Environment : Nature of Work

Information Sources	Teaching (N=1)		Research (N=23)		Both (N=24)	
	Mean Use Score(Rank)		Mean Use Score(Rank)		Mean Use Score(Rank)	
Primary Journals	2.0	(3)	3.21	(2)	3.41	(2)
Research Reports	4.0	(1)	3.04	(4)	2.71	(7)
Conference/Seminar Papers	2.0	(3)	2.13	(8)	2.92	(5)
Patents	2.0	(3)	0.47	(24)	0.67	(21)
Standards	2.0	(3)	1.0	(19)	0.46	(22)
Trade Catalogues	-		0.91	(20)	1.0	(19)
Theses and Dissertations	4.0	(1)	2.48	(6)	2.04	(13)
Personal Contacts	-		1.65	(13)	2.46	(8)
Private Files	-		0.83	(21)	1.0	(19)
Newspapers	4.0	(1)	2.17	(7)	2.25	(10)
Govt Publications	4.0	(1)	1.26	(18)	1.42	(17)
Reprints/Preprints	3.0	(2)	3.52	(1)	3.79	(1)
Abstracting and Indexing Journals	4.0	(1)	3.17	(3)	3.29	(3)
Subject Bibliographies	3.0	(2)	2.04	(9)	2.75	(6)
Monographs/Textbooks	3.0	(2)	2.65	(5)	3.13	(4)
Dictionaries	2.0	(3)	2.04	(9)	2.38	(9)
Encyclopedias	1.0	(4)	1.91	(10)	2.08	(12)
Yearbooks & Directories	1.0	(4)	1.43	(16)	1.46	(16)
Geographical Sources	-		0.56	(23)	0.88	(20)
Handbooks and Manuals	-		1.48	(15)	2.04	(13)
Library Catalogue/s	2.0	(3)	1.78	(11)	2.08	(12)
Bibliography of Bibliographies	2.0	(3)	0.65	(22)	1.63	(15)
Guides to Subject Literature	2.0	(3)	1.74	(12)	1.83	(14)
Institutional Sources	2.0	(3)	1.61	(14)	2.13	(11)
Audio-visual Sources	1.0	(4)	0.65	(22)	1.16	(18)
Library Personnel	1.0	(4)	1.39	(17)	1.58	(15)

$W = 0.333$; $X^2 = 24.98$; $X_{\propto}^2 = 38.8$; df=26; $\propto = 0.05$

Table 17

Use of Information Sources by the Biological Scientists in a University Environment: Nature of Research

Information Sources	Basic Research (N=19)	Applied Research (N=13)	Both (N=16)
	Mean Use Score(Rank)	Mean Use Score(Rank)	Mean Use Score(Rank)
Primary Journals	3.42 (2)	3.15 (2)	3.25 (4)
Research Reports	2.58 (5)	3.15 (2)	3.31 (3)
Conference/Seminar Papers	2.37 (6)	2.62 (6)	2.63 (6)
Patents	0.32 (24)	0.38 (21)	1.13 (16)
Standards	0.26 (25)	1.0 (18)	1.13 (16)
Trade Catalogues	0.58 (23)	1.15 (16)	1.19 (15)
Theses and Dissertations	2.16 (8)	2.85 (4)	2.00 (9)
Personal Contacts	2.11 (9)	1.85 (12)	2.06 (8)
Private Files	0.84 (21)	0.69 (20)	1.13 (16)
Newspapers	1.63 (14)	2.69 (5)	2.5 (7)
Govt Publications	0.95 (19)	1.62 (15)	1.75 (11)
Reprints/Preprints	3.53 (1)	3.69 (1)	3.86 (1)
Abstracting and Indexing Journals	3.21 (3)	2.92 (3)	3.56 (2)
Subject Bibliographies	2.16 (8)	2.31 (8)	2.81 (5)
Monographs/Textbooks	2.79 (4)	2.54 (7)	3.25 (4)
Dictionaries	2.21 (7)	1.85 (12)	2.5 (7)
Encyclopedias	1.89 (10)	2.15 (9)	1.94 (10)
Yearbooks & Directories	1.32 (17)	1.77 (13)	1.31 (14)
Geographical Sources	0.68 (22)	0.85 (19)	0.63 (18)
Handbooks and Manuals	1.68 (13)	1.92 (11)	1.56 (12)
Library Catalogue/s	1.84 (11)	2.08 (10)	2.00 (9)
Bibliography of Bibliographies	1.05 (18)	1.00 (18)	1.56 (12)
Guides to Subject Literature	1.47 (16)	1.62 (15)	1.94 (10)
Institutional Sources	1.74 (12)	1.85 (12)	2.00 (9)
Audio-visual Sources	0.89 (20)	1.08 (17)	0.81 (17)
Library Personnel	1.58 (15)	1.69 (14)	1.38 (13)

$W=0.598$; $X^2 = 44.85$; $X_{\propto}^2 = 38.8$; $df=26$; $\propto = 0.05$

ordering of different sources of information among the biological scientists by their age. The Kendal's computed coefficient of concordance indicated that ($W=0.492$; $X^2=36.9$; $X \propto^2=38.88$; df=26; $\propto=0.05$) there was no significant relationship as to the rank ordering of different sources of information among the biological scientists belonging to the different age group. Table 15 shows the mean use score and rank ordering of sources of information among the biological scientists versus the teaching and research experience. The Kendal's Computed coefficient of concordance ($W=0.526$; $X^2=39.45$; $X\propto^2=38.8$; df=26; $\propto=0.05$) showed that there was a strong relationship as far as the use of different sources of information among the biological scientists with their varied experience. The use of information sources among the biological scientists and the nature of work is shown in Table 16. From the Kendal's computed concordance of coefficient ($W=0.333$; $X^2=24.98$; $X\propto^2=38.8$; df=26; $\propto=0.05$) it was found that there was no significant relationship with regard to the use of information sources among the biological scientists by their nature of work, but there was a significant relationship regarding the rank ordering of information sources as indicated by the Kendal's concordance of coefficient ($W=0.598$; $X=44.85$; $X\propto^2=38.8$;df=26; $\propto=0.05$) among the biological scientists by their nature of research work (Table 17). Thus, the personal attributes such as designation, experience and nature of research work have bearing on the use of information sources, while qualifications, sex, age, and nature of work have no bearing on the use of information sources among the biological scientists in a university environment.

SUMMARY OF FINDINGS

Some of the important findings of the study are reprints/preprints, abstracting and indexing journals, primary periodicals, research reports and subject bibliographies were the most frequently used sources of information. The monographs/textbooks, library catalogues and newspapers were frequently used and dictionaries, personal contacts, conference/seminar papers, yearbooks and directories, encyclopedias, theses and dissertations, handbooks and manuals, and institutional sources were occasionally used. Library personnel and government publications were rarely used, while standards, patents, private files, trade catalogues, geographical sources, audio-visual sources, bibliography of bibliographies, guides to subject literature were never used by the majority of biological scientists in a university environment. The personal attributes such as designation, experience and nature of research work have bearing on the use of information sources, while qualifications, sex, age, and nature of work have no bearing on the use of information sources among the biological scientists in a university environment. The findings of the study have implications for deciding the sources of information for collection development in university libraries in India.

Appendix-I

QUESTIONNAIRE

1. Name : ....

2. Designation :
   - ( ) Professor
   - ( ) Reader
   - ( ) Lecturer
   - ( ) Research Scholar

3. Name of the Department :
   - ( ) Botany
   - ( ) Zoology
   - ( ) Biochemistry

4. Qualifications :
   - ( ) Ph. D.
   - ( ) Non-Ph. D

5. Sex :
   - ( ) Male
   - ( ) Female

6. Age (in years) :
   - ( ) < 35
   - ( ) 36-45
   - ( ) > 46

7. Experience in teaching and research :
   - ( ) Initial Phase
   - ( ) Middle Phase
   - ( ) Later Phase

8. Nature of Work :
   - ( ) Teaching
   - ( ) Research
   - ( ) Both

9. Nature of Research :
   - ( ) Basic
   - ( ) Applied
   - ( ) Both

10. Do you have publications to your credit?
    - ( ) Yes
    - ( ) No

contd.

11. Please indicate the frequency of use of the following information sources for meeting your information requirements. Please tick (√) the appropriate one

Information Sources	Most Frequently Used	Frequently Used	Occasionally Used	Rarely Used	Never Used
	4	3	2	1	0
Primary Journals	( )	( )	( )	( )	( )
Research Reports	( )	( )	( )	( )	( )
Conference/Seminar Papers	( )	( )	( )	( )	( )
Patents	( )	( )	( )	( )	( )
Standards	( )	( )	( )	( )	( )
Trade Catalogues	( )	( )	( )	( )	( )
Theses and Dissertations	( )	( )	( )	( )	( )
Personal Contacts	( )	( )	( )	( )	( )
Private Files	( )	( )	( )	( )	( )
Newspapers	( )	( )	( )	( )	( )
Govt Publications	( )	( )	( )	( )	( )
Reprints/Preprints	( )	( )	( )	( )	( )
Abstracting and Indexing Journals	( )	( )	( )	( )	( )
Subject Bibliographies	( )	( )	( )	( )	( )
Monographs/Textbooks	( )	( )	( )	( )	( )
Dictionaries	( )	( )	( )	( )	( )
Encyclopedias	( )	( )	( )	( )	( )
Yearbooks & Directories	( )	( )	( )	( )	( )
Geographical Sources	( )	( )	( )	( )	( )
Handbooks and Manuals	( )	( )	( )	( )	( )
Library Catalogue/s	( )	( )	( )	( )	( )
Bibliography of Bibliographies	( )	( )	( )	( )	( )
Guides to Subject Literature	( )	( )	( )	( )	( )
Institutional Sources	( )	( )	( )	( )	( )
Audio-visual Sources	( )	( )	( )	( )	( )
Library Personnel	( )	( )	( )	( )	( )

Place:
Date:

Signature of the respondent

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AN ASSESSMENT AND EVALUATION OF HUMAN RESOURCE MANAGEMENT ISSUES IN THE ACADEMIC LIBRARIES OF LUCKNOW : A STUDY

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Human Resource Management (HRM) is a function performed in organizations that facilitate the most effective use of employees to achieve organizational and individual goals. Maximizing the efforts and contributions of human beings is a major problem today in the libraries and information centres (LICs).

As a part of this study, nineteen academic libraries of Lucknow were surveyed to assess the human issues related to human resource management in these libraries. Current status of professionals engaged, their views and remarks for improving library services to better meet the user needs is also discussed.

Survey results indicate that persons engaged in libraries are not satisfied with their job, work culture, and promotional propects. Recommendations for improving library services and strategies for implementing these recommendations are discussed. It has been emphasized that effective HRM is the only way to get best out of the people for successful management of LICs.

INTRODUCTION

One of the most talked about subjects in corporate circles in recent times is how to optimise the contribution of human resources and human relations in achieving organizational goals and objectives. Library, being a non-profit organization, is basically a people's organization. Maximizing the efforts and contributions of human beings is presently a major problem in the libraries and information centres (LICs). One technique which is prominently highlighted as a vehicle for successful management of an organization is the attention to be given to human resource management (HRM). The modern approach of HRM is to introduce a new work culture in organizations to achieve desired goals and results, by motivating the staff and enabling them to acquire the necessary new and innovative skills, giving recognition to best performances and appropriately rewarding such performance.

A study was undertaken to assess and evaluate the human resource management issues in the academic libraries of Lucknow. For the purpose of this study, a total of 19 academic libraries including post graduate and degrees college libraries of Lucknow were selected. The University of Lucknow library was excluded.

OBJECTIVES

The objectives of the present study are:

(i) To assess the human resource base in the academic libraries i.e. manpower requirements, job-description etc.

(ii) To assess and evaluate the opportunities available to library personnel for their career growth and development.

(iii) To assess the interpersonal relations among the library personnel.

(iv) To assess the performance appraisal and job-satisfaction of the library personnel.

(v) To assess the concept of empowerment in the academic libraries.

(vi) To assess the impact of information technology on human resources.

METHODOLOGY

For collection of data, a survey was undertaken in 19 different academic (post-graduate college & degree college) libraries of Lucknow excluding the University of Lucknow library. Two sets of questionnaires one meant for the librarian and another for library staff were distributed for collection of data. Besides this, personal visits were made to all the institutions for collection of the data. A total of 88 professionals responded and data available from these 88 professionals has been used to draw conclusions.

OBSERVATIONS AND DISCUSSION

Table 1 shows the status of presently available manpower in the academic libraries of Lucknow. It reveals that the libraries are suffering due to acute shortage of manpower. The present staff-strength was found to be inadequate. Two libraries were found to be without any staff putting a question mark on their survival. In three libraries, there was only the librarian to cater to the needs of its clientele without any supporting staff. Total strength of staff consisted of 34 (38.6%) professionals, 17(19.3%) semi-professionals and 37(42.1%) non-professionals in the college libraries of Lucknow.

Table 1

Status of Present Staff Strength

Sl. No.	Name of the Library	Professional	Semi Professional	Non Professional	Total
1.	Lucknow Christian Degree College Library	2	2	4	8
2.	B.S.N.V. Degree College Library	4	-	4	8
3.	J.N.P.G. College Library	6	2	2	10
4.	Shiya Degree College Library	3	3	6	12
5.	D.A.V. College Library	1	-	-	1
6.	Mumtaz Degree College Library	1	1	1	3
7.	Amiruddaula Islamia Degree College Library	1	1	2	4

contd.

table 1 (contn.)

Sl. No.	Name of Library	Professional	Semi Professional	Non	Total Professional
8.	Kalicharan Degree College Library	1	-	-	1
9.	Vidyant Hindu Degree College Library	-	-	-	-
10.	National Degree College Library	-	-	-	-
11.	Avadh Girls Degree College Library	2	-	1	3
12.	I. T. College Library	1	2	2	5
13.	Khunkhun Ji Girls P.G. College Library	1	1	1	3
14.	Nav Yug Girls P. G. College Library	2	1	3	6
15.	Mahila Vidayalaya Degree College Library	2	1	6	9
16.	Jubilee Girls Degree College Library	1	-	-	1
17.	Nari Shiksha Niketan Girls Degree College Library	2	1	2	5
18.	Karamat Husain Muslim Girls Degree College Library	1	1	2	4
19.	Shashi Bhusan Balika Vidyalaya Girls Degree College Library	3	1	1	5
	Total	34(38.6%)	17(19.3%)	37(42.1%)	88(100%)

Table 2 shows the proposed staff strength by the library authorities of the respective colleges. It reveals that a total of 141 persons were proposed which consists of 34 (24.11%) professionals, 51 (36.17%) semi-professionals and 56 (39.72%) non-professionals.

Table 2

Proposed Man Power in Libraries by Library Authorities

Sl. No.	Name of Library	Professional	Semi Professional	Non	Total Professional
1.	Lucknow Christian Degree College Library	4	4	8	16
2.	B.S.N.V. Degree College Library	-	3	3	6
3.	J.N.P.G. College Library	4	2	6	12
4.	Shiya Degree College Library	3	3	6	12
5.	D.A.V. College Library	2	6	4	12
6.	Mumtaz Degree College Library	1	3	2	6
7.	Amiruddaula Islamia Degree College Library	1	2	1	4
8.	Kalicharan Degree College Library	4	6	10	20
9.	Vidyant Hindu Degree College Library	2	3	3	8
10.	National Degree College Library	3	3	4	10
11.	Avadh Girls Degree College Library	-	2	1	3

contd.

table 2 (contn.)

Sl. No.	Name of Library	Professional	Semi Professional	Non	Total Professional
12.	I. T. College Library	1	2	2	5
13.	Khunkhun Ji Girls P.G. College Library	1	2	1	4
14.	Nav Yug Girls P. G. College Library	1	2	-	3
15.	Mahila Vidayalaya Degree College Library	6	4	-	10
16.	Jubilee Girls Degree College Library	-	1	2	3
17.	Nari Shiksha Niketan Girls Degree College Library	-	1	2	3
18.	Karamat Husain Muslim Girls Degree College Library	1	1	-	2
19.	Shashi Bhusan Balika Vidyalaya Girls Degree College Library	-	1	1	2
	Total	34(24.11%)	51(36.17%)	56(39.72)	141(100%)

The above two tables show that there is a great difference between the presently available and the proposed staff-strength in every college library which is responsible for the poor services of the libraries.

Table 3 shows the status of some HRM issues in the libraries. It reveals that

a) 87(99%) persons were not satisfied with their salaries and only one person (1%) was found to be satisfied.

b) Working conditions at their work place were not found to be satisfactory by 70(79.55%) persons whereas 18(20.45%) persons found it satisfactory.

c) 70 (79.55%) persons were found satisfied with the opportunities they got to take part in seminars/symposia/workshops, whereas 18(20.45%) persons were not satisfied.

d) Opportunities to enhance qualifications were found to be very satisfying among 70(79.55%) persons, 8(9.09%) persons were found just satisfied whereas 10(11.36%) persons were dissatisfied.

e) Criteria of promotion was not found satisfactory among all the 88 (100%) library personnel.

f) Interpersonal relations were found very satisfactory in all the libraries (100%). The relations of the library personnel with authorities, section-in-charge and colleagues were good, cooperative and cordial.

g) On the whole, the library personnel (100%) were found completely dissatisfied with their jobs.

Table 3

Status of some HRM Issues

Sl.No.	HRM Issues	Very Satisfied	Satisfied	Not Satisfied
1.	Salary	-	1	87
2.	Working Conditions	-	18	70
3.	Opportunity to take part in seminars/symposia/ Workshops	-	70	18
4.	Opportunity to enhance qualifications	70	8	10
5.	Criteria of Promotion	-	-	88
6.	Interpersonal relations	88	-	-
7.	Job Satisfaction	-	-	88

Table 4 reveals that no library staff mannual existed as such in any library although specific duties were assigned to different members of the staff from time to time. It depicts that staff appraisal was nowhere found in any library. It also shows complete lack and awareness of the concept of empowerment in the libraries. It also reveals that none of the libraries surveyed were having computer facility except one.

Table 4

Status of Staff Manual, Staff-Appraisal, Empowerment and IT

Sl. No.	HRM Issues	Total Libraries : 19 Present	 Absent
1.	Staff-Manual	-	19
2.	Staff-Appraisal	-	19
3.	Empowerment	-	19
4.	Information Technology (Computer Facility)	1	18

FINDINGS AND SUGGESTIONS

Findings

On the basis of data collected and data analysis, the following findings have emerged.

- The present staff strength was, however, felt inadequate in most of the libraries. Some libraries were found without staff putting a question mark to their survival.

- No recruitment policies as decided by the UGC formula, DRDO formula etc. were followed in the appointment of library personnel. Instead, government norms have been observed.

- As far as recruitment, current status and development activities were concerned, the job description differed from what was advertised in majority of the cases.

- No fresh recruitments have been made within last 5-10 years in most of the libraries, even though many persons have retired.

- Facilities available to the library personnel for their career growth and development were not found to be upto the mark as compared to teachers.

- Although specific duties were assigned to different members of the staff, no library staff manual has existed as such.

- Staff appraisal was nowhere found in the libraries.

- The concept of empowerment has not persisted anywhere as the powers rested only with the next man in command and not with all personnel.

- In most of the cases, the relations of the library personnel with authorites, section-in-charge and colleagues were usually cooperative and cordial.

- None of the libraries were found having computer facility except in one case where CDS/ISIS package was also available. Library personnel were found reluctant to adopt information technology as they were not trained to handle it.

As a whole, the library personnel were found completely dissatisfied with their jobs.

Suggestions

Based on the above findings, the following suggestion are put forth:

- A library staff manual should be designed covering job description, role elements, responsibility structure, role relations, tools and techniques related to each job, etc. This would relieve the librarian from getting involved in routine matters. The staff would also get sufficient clarity regarding 'who is to do what'.

- Empowerment is another area which needs to be taken care of. Empowerment allows the concerned staff member to work out suitable solutions for some problematic cases within the norms and standards prescribed for the purpose. It can work only in an organization where the climate of trust exists.

- Staff development is another area to which more attention is required. Managers should look into the training need requirements of the staff. When properly trained, the staff member will be in a position to take independent decisions and with empowerment added to the job will be in a position to take quick decision without losing time and sacrificing customer satisfaction.

- There should be proper and more encouragement to acquire professional qualifications, approving and sponsoring the staff to attend seminars/symposia/workshops/training courses, etc., thereby helping them by motivating to learn new skills (for example, computers etc.)

- Promotional benefits should be provided to all eligible members on account of their service record and confidential reports. Promotional avenues are a source to boost the morale and interest of the staff to their highest pitch otherwise there would be neither keen interest to work nor any future prospects to get themselves highlighted on account of their working capability. There must be certain guidelines and avenues for their regular promotion.

All the libraries should be equipped with computers so as to provide fast services as this generation is regularly haunted by advancement of the technology lying at the threshold of the latest information. Thus computerization of libraries would save a lot of time of manpower which may be utilized for other advantageous and useful purposes of the libraries.

Total Quality Management approach must be taken into account to improve the efficiency, ability and total output of the library personnel. This would enhance smooth performance and excellent functioning of the libraries thus finally providing better and improved library and information products and services of quality thus ensuring complete customer satisfaction ultimately entirely satisfying the laws of library science.

EPILOGUE

Human relations oriented management process is the only way to get the best out of the people for successful management of LICs. Human relations in this context will come to occupy a centre stage more and more in future. And with that every success and good opportunities are possible to reap in today's competitive world.

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Appendix-1

QUESTIONNAIRE FOR LIBRARIAN

1. Name (in full) :
2. Designation :
3. Your educational qualifications :
4. Years of experience in the profession :
5. Library budget for the last 3 years :

1995 - 96 ____________
1994 - 95 ____________
1993 - 94 ____________

6. A. What information technology (IT) products are being used?
   - (i) Computers : Yes/No
   - (ii) CD - ROM : Yes/No
   - (iii) Fax : Yes/No
   - (iv) E-Mail : Yes/No
   - (v) Others (Please specify) :

   B. Available manpower capable to handle any/all of these:No. ____________

7. What library and information services are being offered ?
   - (i) Circulation : Yes/No
   - (ii) Reference : Yes/No
   - (iii) Interlibrary loan : Yes/No
   - (iv) C.A.S. : Yes/No
   - (v) S.D.I. : Yes/No
   - (vi) Bibliographies : Yes/No
   - (vii) CD-ROM : Yes/No
   - (viii) Microfiche Reading : Yes/No
   - (ix) Newspaper Clipping : Yes/No
   - (x) Others :

8. a. Clientele Strength Categories : No. ____________
   - (i) Teachers :
   - (ii) Research Scholars :
   - (iii) Students :
   - (iv) Technical personnel :
   - (v) Administrative :
   - (vi) Clerical staff :
   - (vii) Others :

   b. Number of users to the library on an average per day: -

8. Job Description
   - (i) Job description as advertised : ____________
   - (ii) Whether job description differs from that advertised. : Yes/No
   - (iii) Job description (at initial appointment). : ____________
   - (iv) Job description (now, if different). : ____________
   - (v) Job description in between (iii) and (iv), if different : ____________

9. Whether Librarian has specified any manual or Instrument ? : Yes/No

10. Whether Job assigned according to the position? : Yes/No

11. To whom you are responsible for your work? : ____________

12. Are you satisfied with your job/position? Please tick. :

		Very satisfied	satisfied	Non-satisfied
a)	Your pay :	________	________	________
b)	Working conditions :	________	________	________
c)	Type of job offered to you :	________	________	________
d)	Opportunities for steady work :	________	________	________
e)	Opportunities to take part in seminars/ symposia/workshops :	________	________	________
f)	Opportunities to enhance your qualifications	________	________	________
g)	Criteria of promotion :	________	________	________
h)	Co-operation among your colleagues :	________	________	________
i)	The extent to which your boss is fair to you :	________	________	________
j)	Express your ideas on job satisfication :	________	________	________

13. Which factors motivate you to work ? ________

14. Which factors account for the dissatisfaction with your present job ? ____________

15. Your relations with :

		Very good	Neutral	Cooperative
(i)	Authorities :	________	_____	________
(ii)	Section In-charge :	________	_____	________
(iii)	Colleagues :	________	_____	________

16. Do the authorities always do justice to you : Yes/No/Neutral

17. Do you get any inspiration/suggestions/ guidance from your authorities/ section-in-charge/users? : Yes/No/Neutral

18. Evaluation Mechanism:
    a) Is there any assessment scheme Yes/No
    b) Who is being benefitted from that scheme. ________
    c) Procedure for the APPRAISAL : (Please tick)
        (i) Self Appraisal : (   )
        (ii) Remarks of the Reviewing/Reporting Officer : (   )
        (iii) Are you shown the final remarks : Yes/No
        (iv) Do you have any say in that ? : Yes/No
        (v) If Yes, how? : ________
        (iv) Are you satisfied with the procedure of Appraisal? : Yes/No

19. Do you think you are giving your best to the library? : Yes/No

20. Any other suggestions or remarks you would like to mention. : ________

Date: ________1996

____
Signature

Appendix-2

QUESTIONNAIRE FOR LIBRARY STAFF

1. Name (in full) :
2. Designation :
3. Since when are you :

		Date	Designation	Salary-scale
A.	In the organisation :	______	________	_________
B.	In the present post :	______	________	_________

4. Qualifications :

		At the time of joining	Present
A.	Academic :	______________	______
B.	Professional :	______________	______

5. Training(s) if any (Please give details) :

At the time of Joining	Present
______________	______

6. Mode of Recruitment : Direct Appointment/Promotion (Please/tick)

A.	Present position :	________	_________
B.	Previous position :	________	_________

7. Nature of job:

A. Nature of job (at initial appointment) : ________________________

B. Nature of job(now), if different from above) : ________________________

C. Nature of job in between "A" & "B", if different ________________________

a. Staff strength No.

(Library)		With Information Technology (IT)	Without Information Technology(IT)
(i)	Professional :	________	_________
(ii)	Semi-professional :	________	_________
(iii)	Non-professional (support staff) :	________	_________

b. Is there any basis for this staff strength (Staff formula, work load norms etc.) If yes, what (Please specify) : Yes/No

c. Are you satisfied with the present staff strength? : Yes/No

	Professional	**Semi-Professional**	**Non-Professional**
d. If not, the proposed no. of staff.	______	______	______
10. What is the method of selection & recruitment? (Please tick)	Written Test ______	Interview ______	Any others ______
11. Growth in staff during the last 10 years. (Please give the no.)	Professional ______	Semi-Professional ______	Non-Professional ______
12. When was the last appointment made in your library (Please give the year & the position)	______	______	______
13. Vacant Posts, if any :	______	______	______
14. What are the criteria/ factors to be considered in the staff deployment policy?	______	______	______

15. Facilities available to library personnel for their career growth and development.

a. Can do research for award of PHD Degree : Yes/No
b. Permitted to attend symposia/seminars/conferences. : Yes/No
c. Can join training courses. : Yes/No
d. Have facilities to go abroad. : Yes/No
e. Facilities to go on deputation in other organisations in India. : Yes/No
f. Involvement in different in-house committees. : Yes/No

16. Are the facilities available to library personnel for their career growth and development equal/more/less in comparision to teachers. Equal ____ More ____ Less ____

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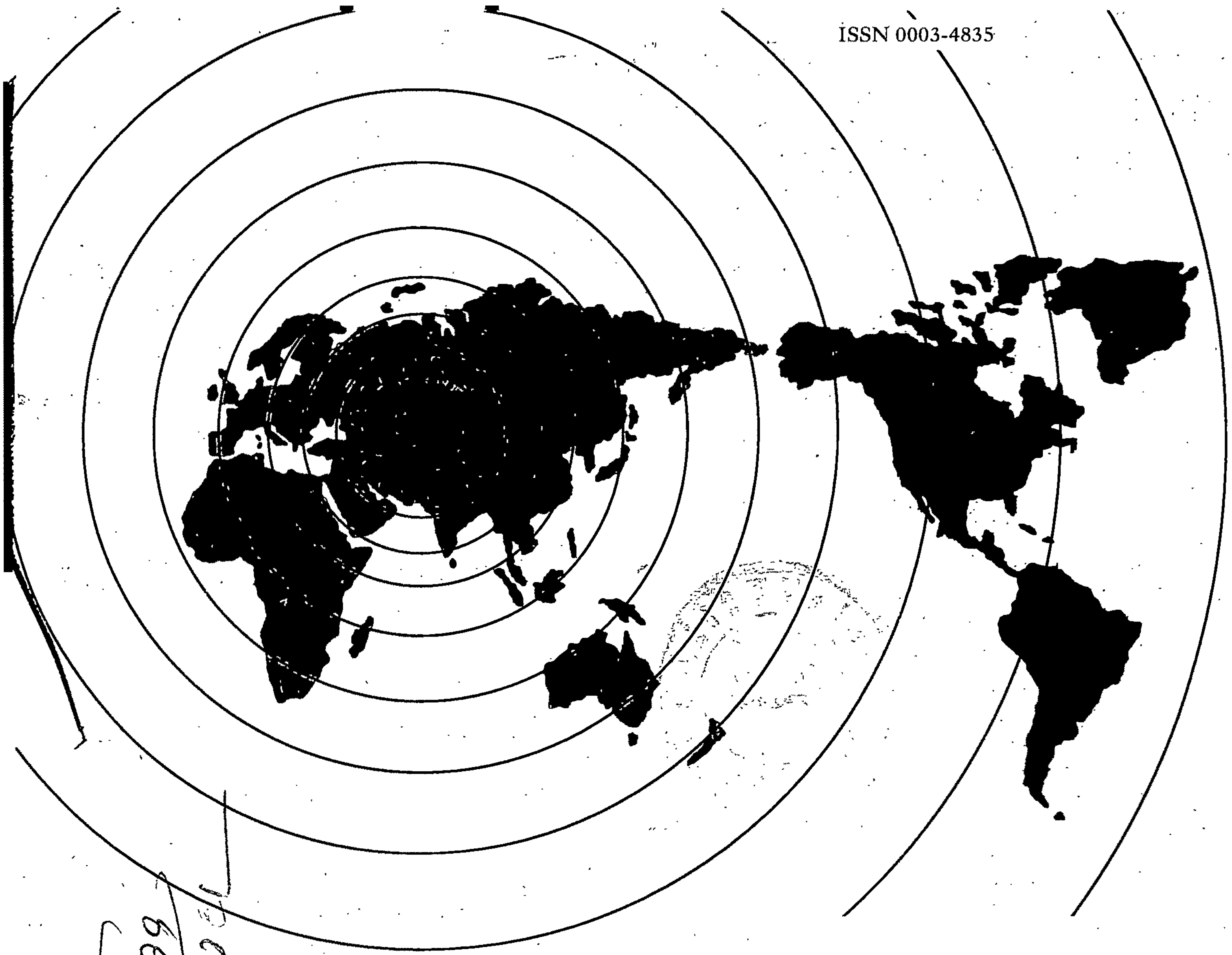

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JOURNAL OF PLANTATION CROPS - A BIBLIOMETRIC APPRAISAL

THAJUDIN S
CPCRI(RS)
Kayangulam

Articles published in the Journal of Plantation Crops during the period 1973-96 have been subjected to bibliometric analysis. The study throws light on the different aspects of the publications such as nature of communication, geographical distribution, authorship pattern and citations. Quantitative output in the different areas of research pertaining to plantation crops has been projected.

INTRODUCTION

The term *Bibliometrics* has been defind as 'organisation, classification, and quantitative evaluation of publication patterns of macro and micro communications alongwith their authorship by mathematical and statistical calculus'[1]. The usage of the term 'plantation crops' probably originated in the US colonial period, when slaves were widely employed as labourers in cotton and sugar cane plantations [2]. There are a group of commercial crops of perennial nature cultivated extensively in the tropics/sub tropics, which demand employment of labour throughout the year[3]. In India, the major plantation crops of economic importance are tea, coffee, rubber, cardamom, cinchona, cotton, coconut, arecanut, pepper and sugarcane. Of late, oil palm, tree spices and cocoa have also gained significance.

At present, researches on plantation crops in India are being organised and managed by different agencies like the Indian Council of Agricultural Research (ICAR), Spices Board, Rubber Board, Coffee Board, United Planters' Association of South India (UPASI), Tea Research Association and the various agricultural and other universities.

METHODOLOGY

In this study an attempt has been made to analyse the articles published in the 24 volumes of *Journal of Plantation Crops* (JPC) (1973-96) employing bibliometric techniques. JPC is the official organ of the Indian Society for Plantation Crops (ISPC) which was founded in 1971. Its headquarters is at the Central Plantation Crops Research Institute (CPCRI), Kasaragod which is one of the major Research Institutes under the ICAR. The publication of the JPC was started in 1973 with the release of a single issue in that year. From 1974 onwards annual volumes each comprising 2 half yearly numbers are being published. The journal publishes original research papers, reviews, short scientific reports and book reviews pertaining to plantation crops.

All the articles have been scrutinised and grouped under different categories and the data presented in appropriate tables. This study does not include the proceedings of the *Plantation Crops Symposia* held under the auspices of the ISPC.

RESULTS AND DISCUSSION

The 24 volumes of the journal under study carried a total of 558 articles. Of these, 320 (57.35%) are full length research articles, 177(31.72%) are short scientific reports/notes, 46(8.24%) are review articles and 15(2.69%) are other communications in the form of reports or comments etc. as shown in Table 1.

Table 1

Form-wise distribution of Communications

Volume No.	Research Articles	Short Scientific Reports	Review Articles	Other Communications	Total
1	8	0	1	0	9
2	18	6	0	0	24
3	18	3	2	0	23
4	11	8	2	0	21
5	10	8	5	3	26
6	13	6	2	1	22
7	9	2	2	1	14
8	10	4	2	1	17
9	15	6	1	1	23
10	11	6	2	0	19
11	19	5	2	1	27
12	18	10	0	2	30
13	13	14	2	1	30
14	19	6	1	0	26
15	13	13	1	1	28
16	12	14	1	0	27
17	15	10	1	0	26
18	12	6	2	0	20
19	6	5	12	0	23
20	17	11	1	0	29
21	10	17	0	1	28
22	12	8	1	1	22
23	16	4	1	1	22
24	15	5	2	0	22
Total (%)	320 (57.35)	177 (31.72)	46 (8.24)	15 (2.69)	558 (100)

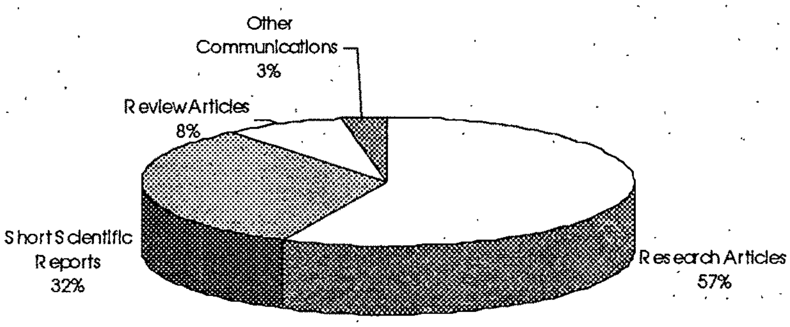

Fig 1 : Form-wise distribution of Communications

Geographical distribution

Five hundred and two articles (89.96%) are authored by Indians and the rest 56 (10.04%) are contributed by foreign authors. The ratio between Indian and foreign contributions is 9:1 (Table 2).

Table 2

Geographical Distribution of Communications

Volume No.	Indian	Foreign	Total
1	8	1	9
2	22	2	24
3	22	1	23
4	20	1	21
5	22	4	26
6	19	3	22
7	11	3	14
8	15	2	17
9	18	5	23
10	18	1	19
11	22	5	27
12	23	7	30
13	28	2	30
14	25	1	26
15	25	3	28
16	26	1	27
17	24	2	26
18	18	2	20
19	23	0	23
20	26	3	29
21	26	2	28
22	22	0	22
23	22	0	22
24	17	5	22
Total (%)	502 (89.96)	56 (10.04)	558 (100)

The distribution pattern of the 56 foreign contributions (Table 3) is 24 from Sri Lanka, 16 from Nigeria, 6 from USA, 2 each from Bangladesh, Brazil and Netherlands and one each from Costa Rica, Indonesia, Jamaica and Male. The predominance of contributions by Indian authors may be due to the fact that the crops dealt with are mostly indigenous.

Table 3

Contribution by Foreign Institutions

Sl. No.	Country	No. of Articles
1.	Sri Lanka	24
2.	Nigeria	16
3.	U S A	6
4.	Bangladesh	2
5.	Brazil	2
6.	The Netherlands	2
7.	Costa Rica	1
8.	Indonesia	1
9.	Jamaica	1
10.	Mali	1
	Total	56

Authorship pattern

The analysis of authorship pattern reveals that two-author papers top the list (38.17%) followed by three-author papers(26.34%). This is followed by single author (20.07%) while 15.40% of the papers are by 4 or more authors. About 48% of the review articles are contributed by single authors. In one of the articles, the number of the authors is as high as 14. A perusal of the general authorship pattern shows that about 80% of the papers are authored by two persons and above while the rest are single authored ones (Table 4). This indicates that there is a tilt towards multiple authorship. This can be attributed to the necessity for multidisciplinary approach in dealing with complex problems as is the case with plantation crop research.

Table 4

Authorship Pattern

	Single Author	Two Authors	Three Authors	Four Authors	Five Authors	Six & above	Total
Research articles	54 (16.88%)	128 (40.00%)	84 (26.25%)	36 (11.25%)	11 (3.44%)	7 (2.19%)	320 (100%)
Short scientific reports	27 (15.25%)	71 (40.11%)	48 (27.12%)	26 (14.69%)	3 (1.69%)	2 (1.13%)	177 (100%)
Review articles	22 (47.83%)	11 (23.91%)	12 (26.09%)	1 (2.17%)			46 (100%)
Other Communications	9 (60.00%)	3 (20.00%)	3 (20.00%)				15 (100%)
Total (%)	112 (20.07)	213 (38.17)	147 (26.34)	62 (11.11)	14 (2.51)	10 (1.79)	558 (100)

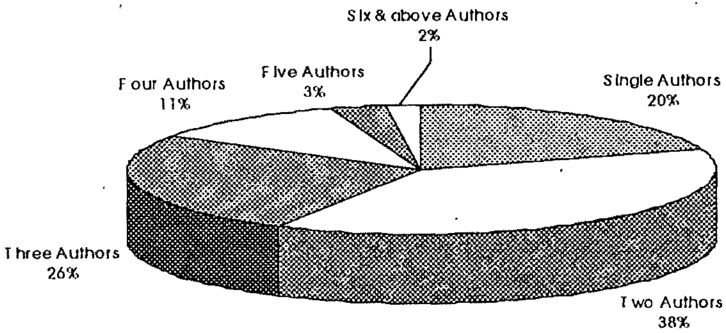

Fig 2 : Authorship Pattern

Institute wise distribution

A significant proportion of the total articles 239 (42.83%) has come from Central Plantation Crops Research Institute (CPCRI) followed by Kerala Agricultural University 51 (9.14%), University of Agricultural Science, Banagalore, 24 (4.29%), UPASI 15(2.69%), Tamil Nadu Agricultural University 14(2.51%), Rubber Research Institute of India 11(1.97%), Andhra Pradesh Agricultural University 11(1.97%), Indian Institute of Spices Research (formerly National Research Centre for Spices) 10 (1.79%). Other 82 Institute/Universities have contributed 183 articles which is less than 10 articles each (Table 5). Of these 82 institutes, 51 are research centres, 26 are universities/ colleges, 3 are Krishi Vigyan Kendras and two are private sources.

Table 5

Institutewise Distribution

Sl.no.	Institute	Articles	Percentage
1.	Central Plantation Crops Research Institute	239	42.83
2.	Kerala Agricultural University	51	9.14
3.	University of Agricultural Science	24	4.29
4.	United Planters Association of South India	15	2.69
5.	Tamilnadu Agricultural University	14	2.51
6.	Rubber Research Institute of India	11	1.97
7.	Indian Institute of Spices Research (formerly NRCS)	10	1.79
8.	Andhra Pradesh Agricultural University	11	1.97
9.	Other Institutes/Universities	183	32.80
	Total	558	100.00

Table 6

Cropwise Distribution

Volume	Arecanut	Black Pepper	Cardamom	Cashew	Cinnamon	Clove	Cocoa	Coconut	Coffee	Ginger	Nutmeg	Oilpalm	Rubber	Tea	Turmeric	Mixed Cropping	General/ Others	Total
1		1		2				3	1				1				1	9
2	3	1	5	3		1	3	3						1	1		3	24
3	3			2				10		1			2			1	4	23
4	6		2	3			1	5						1	1		2	21
5	3	1	1	2			1	10	1	1					2	1	3	26
6	2	4	3		1			7		2	1		1				1	22
7	3	3		1				4	1					1			1	14
8	2	1		1			2	7			1		1	1			1	17
9		2	3	1		1	1	6			1	1	1	4	1		1	23
10	2	2	1				2	5		1	1	2	1		1		1	19
11	2	3	4	1	1		1	7				2		1		2	3	27
12	1	3	1	4			1	10		1		1	2	2	1	1	2	30
13	2	5	1	2		1	1	13			1			2			2	30
14		3		3			1	13					1	1	2	1	1	26
15	1	1	2	1		1		11	1	1			4	1	1	2	1	28
16		4		1			1	5		3		2	1	2	2	2	4	27
17	1	2	1	3		1	2	7	1				1	2		2	3	26
18	1	1	1					6			1	1	2	1		2	4	20
19	1	1						14		1				2	1	1	2	23
20		3	1	2			2	4	1			3	2	4	3	2	2	29
21	2		3	7	1		1	4		1		1		2	2		4	28
22			3	2				3			1		1	7		1	4	22
23	1	1	1	4			1	6	1				1	2	1		3	22
24	1	3				1	2	4	1				2	4		1	3	22
Total	37	45	33	45	3	6	23	167	8	12	7	13	24	41	19	19	56	558
(%)	(6.63)	(8.06)	(5.91)	(8.06)	(0.54)	(1.08)	(4.12)	(29.93)	(1.43)	(2.15)	(1.25)	(2.33)	(4.30)	(7.35)	(3.41)	(3.41)	(10.04)	(100.00)

The CPCRI has been dealing with a large number of plantation crops such as coconut, arecanut, oil palm, cocoa, cashew and spices (researches on spices and cashew were separated from the CPCRI in 1986 with the establishment of National Research Centre for Spices and Cashew). This may be the reason for the predominance of the contribution from the CPCRI.

Cropwise distribution

The maximum number of contributions are on coconut (167). The contributions on black pepper, cashew, tea, cardamom and arecanut ranges from 33 to 45. The minimum number(3) of articles have been published on cinnamon. Coconut is the most predominant among plantation crops which has a uniform distribution in Kerala and is being cultivated in sizable areas in the other southern states. Further, there are some very important problems posing challenge to the research workers in respect of coconut which has led to extensive investigations. This appears to be the reason for the publication of a large number of articles on the crop. A sizable number of papers (56) are on the crops which are not generally categorised under plantation crops. They are aromatic grass, beetle vine, chillies, chestnut, citrus, eucalyptus, fennel, mushroom, mango, ornamental palms and vanilla. Of late special emphasis has been given to mixed/intercropping with a view to obtaining maximum returns from unit area of land and 19 papers are on this aspect. (Table 6).

Citation distribution

The citation count reveals that seven thousand eight hundred and nineteen (7,819) references have been cited under the different articles. (Table 7). An average of 14 references are cited per article. The citations in the review articles are comparatively high, the maximum being 214. The maximum number of citations (852) appear in volume 19 since this particular volume contained mostly review articles. This is quite logical since such articles are very comprehensive and exhaustive.

Table 7

Volumewise Distribution of Citations

Volume no.	No.of Articles	No.of Citations	Average Citations/Article
1	9	146	16.22
2	24	198	8.25
3	23	530	23.04
4	21	221	10.52
5	26	333	12.81
6	22	379	17.23
7	14	445	31.79
8	17	362	21.29
9	23	195	8.48
10	19	230	12.11
11	27	356	13.19
12	30	363	12.10
13	30	340	11.33
14	26	299	11.50

contd.

table 7 (contn.)

Volume no.	No.of Articles	No.of Citations	Average Citations/Article
15	28	290	10.36
16	27	267	9.89
17	26	238	9.15
18	20	269	13.45
19	23	852	37.04
20	29	396	13.66
21	28	291	10.39
22	22	239	10.86
23	22	275	12.50
24	22	305	13.86
Total	558	7819	14.01

CONCLUSION

This study was undertaken with the main objective of examining the work done on the various aspects of plantation crops research by subjecting the articles published in the JPC to bibliometric analysis. By and large the research output generated on the different facets of this field is disseminated through the academic journal JPC. The study has brought out many aspects of the work done in the field identifying the strengths and weaknesses of research process over the period.

Acknowledgement

The author is deeply indebted to Dr. P.K. Koshy, Head, CPCRI(RS) Kayangulam for the facilities rendered for the study, Shri Jacob Mathew, Principal Scientist, CPCRI (RS) Kayangulam for his valuable suggestions and to Shri B. Anilkumar for his assistance in computerisation.

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INFORMETRICS ON M.N. SRINIVAS

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National Institute of Fashion Technology
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Hyderabad

M.N. Srinivas, the well known sociologist is widely recognised as architect of modern Indian sociology and social anthropology. His publications have been analysed by year, domain, authorship pattern, channels of communication used, key words etc. The results indicate that the papers published by him are of a nature that qualify him to be a 'role model' for the younger generations to emulate.

By the end of 1995, Srinivas had to his credit 144 papers which included 33 broad papers in sociology and anthropology; 18 papers in social change; 28 papers on village studies; 12 papers on religion; 17 papers on caste and 36 papers of general popular interest. The periods 1958-61 and 1974-77, when Srinivas was 38-41 and 58-61 years old, were his most productive periods with highest publication activity.

INTRODUCTION

Mysore Narasimhachar Srinivas was born on 16th November, 1916 at Bangalore in Karnataka. He started his prosessional career as a Research Assistant at University of Bombay in 1942. He received fellowships such as subject scholar in social philosophy, B.A. (Honours) - University of Mysore, 1934-36; Research Fellow in sociology, University of Bombay, 1940-42; Carnegie Research Grant, Oxford, 1945-49; Simon Senior Fellow, University of Manchester, 1953-54; Rockfeller Fellow, USA, 1956-57; Fellow, Centre for Advanced Study in the Behavioural Sciences, Starford, January 1970-June 1971 and September 1984-December 1985; National Fellow: Indian Council of Social Science Research, 1971-1974; Senior Awardee, Homi Bhabha Fellowships Council, April 1979 - June 1980 and September 1983 - April 1984; Visiting Fellow, Department of Demography, Australian National University, Canberra, November 1980 - February 1981 and Overseas Visiting Scholar, St. John's College, Easter Term, 1982.

Prof. Srinivas was associated with Prof. Ghurye, Head, Department of Sociology, University of Bombay. Srinivas was associated with him in his research including field trips to collect data.

He worked at University of Baroda from 1951 to 1959 and later joined the Delhi University in 1959. He served the university in different capacities and also travelled abroad as a Visiting Professor. Some other assignments included Simon Visiting Professor at University of Manchester, England in May 1963; Andrew D Whyte Professor at large, Cornell University, Ithica, from 1970-76; Handy Professor of Sociology, Hartwick College, Oneonta, N.Y., during 1975 fall; Visiting Professor, University of California, Santacruz; Spring Guank during 1978, University Lecturer in Indian Sociology, Oxford from 1948-51, Professor of Sociology, M.S. University of Baroda, from 1951-58, Professor of Sociology, University of Delhi from 1959-1972. In 1972, he joined Institute for Social and Economic Change (ISEC) in Bangalore as Joint Director.

He worked at the Institute for Social and Economic Change, Bangalore from May 1972 to January, 1979. He was a Visiting Professor, University of New England, Armidalo, New South Wales, Australia from July 1980 to June 1981, Visiting Professor, National University of Singapore from July 1981 to July 1982; Silver Jubilee Visiting Professor, IIT, Madras during April 1984 and Henry R Luca Prof. of Language, Mind and Culture, Wellesley College, USA from 1986-87.

By 1995 he was working as J.R.D. Tata Visiting Professor at the National Institute of Advanced Studies, Bangalore also as Chairman, Institute for Social and Economic Change at Bangalore.

Prof. Srinivas has received several awards for his contributions to the field of Sociology and Social Anthropology. These include:

* Rivers Memorial Medal, RAI, London, 1955.
* Sarat Chandra Roy Gold Medal, Asiatic Society of Bengal, Calcutta, 1955.
* Dedabhai Naroji Prize for Social Sciences other than Economics 1971.
* T.H. Huxley Memorial Medal, RAI, London, 1976.
* G.S. Ghurye Award by the University of Bombay, 1976.
* Padma Bhushan, Government of India, 1976.
* Jawaharlal Nehru Award for contribution to the Social Sciences for the year 1985, Government of Madhya Pradesh, Bhopal, 1988.
* Annandale Memorial Medal for the year 1987, the Asiatic Society, Calcutta.
* Plaque presented by the Indian Science Congress in recognition of contribution made, dedication and commitment to the growth and development of Anthropology as an academic discipline.

Srinivas was elected as President *'Anthropology and Archaeology Section, Indian Science Congress*, Calcutta, 1957 and *Indian Sociological Society*, 1966-69. He was also an elected Honorary fellow, *Royal Anthropological Institute of Great Britain and Ireland*, London, 1964-66; the Asiatic Society of Bombay, November 1991 and Corresponding Fellow, British Academy, 1992. He has also served different organisations as Honorary Life Member which include *South Asia Association*, Australia, 1976; *American Academy of Arts and Sciences*, Boston, 1973; *American Philosophical Society*, Philadelphia, 1974 and; *International Union of Anthropological and Ethnological Sciences*, 1983.

In addition to the above professional honours and distinctions, he was honoured with Honorary D.Sc., University of Chicago during 1971, Honorary D.Litt., University of Mysore, 1972, Doctorate, *Honaris Causa*, University of Nice, France, 1972 and Doctor of Philosophy, *Honoris Causa*, University of Manipur, Imphal, during 1989.

Prof. M.N. Srinivas is a social anthropologist by training and a sociologist by profession. He is known to the students of social sciences in Indian and foreign universities through his valuable sociological concepts like dominant caste, Sanskritisation, westernization and modernization to explore the social structure and change in Indian society. He became an authority on caste and village community in India after publishing his books like *India's villages, Caste in Modern India and other essays* and the *Rembered Village* in addition to his other books and articles in academic and popular journals. M.N. Srinivas is one of those sociologists who created a genuine interest in Indian sociology by the rest of the world. His teachings on Indian sociology and anthropology at University of Baroda and Delhi may be put in golden words, which give terminal departure to the descriptions of Indian sociology earlier to his times. He has credit for a rare distinction for laying down a sound and methodological base for Indian sociology. His concepts like dominant caste and sanskritisation were sold as hot cakes and blew tremendous waves in social science circles. He had a unique style in encompassing any social phenomenon into sociological and anthropological frame work. He left indelible impact on the curricula at the places he worked. At times, he departed horribly from his contemporary thinkers and his own eminent teachers.

The difference was so sharp that he literally stood apart from his close circles for a long time excepting some rare coincidences with his teachers at seminars and conferences. He then worked contrarily and stood apart, he drew more attention with more people flocking at him. He gave an utmost importance to virtue in knowledge than personal and human touch with his colleagues. At times, he was criticised to be too harsh in his outlook towards academic endeavours of other fellow researchers.

In same way or the other no student of sociology or anthropology can afford not to notice and acknowledge his writings. He has made a sound base in Indian sociological history for years to come.

Uniqueness of his personality, research that his harshest critics would like to be in touch with him and show remarkable interest in his writings and activities has been of interest to many.

An informetric analysis of productivity of the subjects he was worked in, is highlighted quantitatively in this paper.

METHODOLOGY

The informing activities of an individual information scientist can be evaluated both quantitatively (how many publications) and qualitatively (where they are published). All the papers of M.N. Srinivas published during 1942-1995 were considered and normal count procedure was followed.

From the personal point of view, there is a no doubt that scientists all over the world look at their own papers exclusively in such a way. Similarly, titles of the articles were analysed and one score was allotted.

Vinkler [9] defines publication density as the number of papers published per number of journals used, and publication concentration as number of journals containing half of the papers published 100 times per total number of journals used during the period under study.

Informetrics is a sub-field which applies quantitative methods to the study of social sciences as an information process in the historical perspective of sociology of knowledge. In this information model, publications are the carriers of information, journals are the communication channels, and bibliographied references represent a special language and impact of research on the development of information flow [7].

RESULTS AND DISCUSSIONS

Dr. M.N. Srinivas has published 132 single author papers during 1942-1995. Teacher - pupil collaboration is a very common mode in an academic setting. The researcher in an institute provides the idea and guidance, teacher the methodology of work, arranges for facilities, overcomes the operational difficulties, clarifies doubts of students, conducts himself in an exemplanary researcher style, sets high standards to be achieved, whereas student does most of the bench work under his supervision. Srinivas has such experiences as a teacher while teaching students at the Universities of Baroda and Delhi, and as a student he assisted Prof. Ghurye, Head of the Department of Sociology at the University of Bombay.

Efficiency of the research process can be judged by completion of the project in turn and essentially within budget. University department is essentially entrused with the goal of knowledge generation and dissemination. In an information society, information generated should ideally be utilized efficiently. However, in most cases, the rate of information utilization has not increased comparably with the rate of information generation [2].

Out of 144 papers of Dr. M.N. Srinivas, he was the first author in 132 papers. He has contributed 6 two authorship papers, 2 papers of three authors and 4 papers with more than 3 authors (Table 1). Peak output years were between 1957-59 during which 13 papers were published and between the years 1954-57 during which 11 papers were published. They coincide between 41-43 and 38-40 years of his age respectively. When age factor was taken into consideration he had produced two authorship papers from 47th year of age. He had to his credit 3 authorship papers after 58 years and more than three authorship papers after 40 years. This indicates a clear cut healthy trend in the span of collaboration activity.

The general finding is that social scientists/ information scientists publish most frequently in their fourth decade of life and thereafter publication rate drops [8]. But in case of Dr. M.N. Srinivas, he

Table 1

Authorship pattern in publications of M.N. Srinivas with collaboration coefficients and age

Year	Single author	Two authors	Three authors	More than 3 authors	Total	Collaboration coefficient	Age of M.N. Srinivas
1942-44	4	-	-	-	4	0.00	26 - 28
1945-47	2	-	-	-	2	0.00	29 - 31
1948-50	-	-	-	-	-	0.00	32 - 34
1951-53	8	-	-	-	8	0.00	35 - 37
1954-56	11	-	-	-	11	0.00	38 - 40
1957-59	13	-	-	1	14	0.07	41 - 43
1960-62	10	-	-	-	10	0.00	44 - 46
1963-65	6	2	-	-	8	0.25	47 - 49
1966-68	9	-	-	1	10	0.10	50 - 52
1969-71	3	-	-	-	3	0.00	53 - 55
1972-74	10	1	-	1	12	0.16	56 - 58
1975-77	14	1	1	-	16	0.11	59 - 61
1978-80	5	-	1	-	6	0.16	61 - 63
1981-83	4	-	-	1	5	0.20	64 - 66
1984-86	6	1	-	-	7	0.14	67 - 69
1987-89	10	1	-	-	11	0.09	70 - 72
1990-92	7	-	-	-	7	0.00	73 - 75
1993-95	10	-	-	-	10	0.00	76 - 79
Total	132	6	2	4	144	1.28	

has published 16 papers when he was between 59-61 years of age and 10 papers when he was between 76-79 years.

Zuckerman [10] compared the age distribution of American nobel laureates in science with the age distribution of American scientists in general. The majority of the nobel laureates were relatively young when they had made their prize winning discovery but majority of the American scientists were also relatively young. Since, the age distribution of laureates matched that of scientists in general, he concluded that when allowance is made for the number of scientists at different ages, younger scientists are not more likely to be creative. However, due to their greater numerical representation, younger scientists are responsible for substantially more important contributions than older scientists [1].

Subject-wise publications of M.N. Srinivas are given in Table 2. He has to his credit 33 papers in the area of sociology and anthropology where peak period of publication was between 1970-1973 and 1974-77 during which 5 papers each were produced. Next peak period was between 1982-85 during which 4 papers were produced. These periods coincide with his age between 50-52, 54-56 and 64-66 years respectively. He published 18 papers on *Social Change* wherein peak period of productivity was 3 papers each between 1966-69, 1974-77 and 1994-97. He published 29 papers on *village studies* in which he had published maximum 9 papers between 1974-77 when he was between 59-61 years age. Also published were 12 papers on *Religion*, 16 papers on *Caste* and 36 papers in General Category of popular interest.

Table 2

Subject-wise publications of M.N. Srinivas

Years	Sociology and Anthropology					Social Chance					Village Studies					Religion					Caste					General					Total	Percentage	Cumulative Percentage
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	ZA	ZB	ZC	ZD			
1942-45	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	4	2.78	2.78
1946-49	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	1.39	4.17
1950-53	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2	5	3.47	7.64
1954-57	-	-	-	-	1	-	-	-	-	-	-	4	2	-	-	-	-	2	1	-	3	-	-	1	-	-	-	-	-	1	15	10.42	18.06
1958-61	1	-	1	-	-	2	-	-	-	-	1	6	-	-	-	1	-	-	-	-	3	-	1	-	-	-	1	-	2	3	22	15.28	33.34
1962-65	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	3	-	4	11	7.64	40.98
1966-69	-	-	-	-	-	1	-	1	-	1	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-	-	-	-	-	4	10	6.94	47.92
1970-73	4	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8	5.56	53.48
1974-77	2	-	3	-	-	1	-	1	1	-	-	7	-	1	1	-	1	-	-	-	-	1	-	-	-	2	-	-	-	2	23	15.97	69.45
1978-81	1	-	1	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	1	7	4.86	74.31
1982-85	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	7	4.86	79.17
1986-89	-	1	2	-	-	1	1	-	-	-	-	2	-	-	-	2	-	1	-	-	1	-	1	-	-	-	-	-	-	1	13	9.02	88.19
1990-93	1	2	-	-	-	2	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	2	11	7.64	95.83
1994-97*	2	-	-	-	-	-	2	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	4.17	100.00

A = Social Anthropology, B = India, C = Culture, D = Research, E = Marraige & Family, F = Social Change, G = South India, H = Modernization, I = Women J = Food Habits, K = Institution, L = Village Studies, M = Mysore, N = Social Stratification, O = South Indian Region, P = Religion, Q = Hinduism R = Sanskritization/Westernization, S = Duty, T = South East, U = Caste, V = Mobility, W = Dominant Caste, X = Modern India, Y = General Z = Philosophy, ZA = Diet, ZB = Social Structure, ZC = Folk Songs, ZD = Miscellaneous

* The list of articles/papers is not exhaustive by 1995, Just to maintain the symmetry of period taken, it has been shown as 1994-97. Practically, the data furnished is for 1994 and 1995 only.

Professional life of a researcher begins with publication of his/her first paper [6]. Papers published during the first half of professional career of Srinivas were 67 in number. Papers published during the second half of his professional life were 79. First 50 percent of articles were published during a period of 30 years of professional career whereas the next 50 percent of articles were published during 23 years of professional career although he had no publications between 1948-50. This has indicated that continuous and uniform productivity is maintained throughout his professional life which is a rare phenomenon.

When publication period i.e., difference between the year of publication of first paper and last paper under present study was calculated, it was observed that M.N. Srinivas had 53 years of publication output. Key words from the titles of the articles were counted and those with frequencies more than two are included in Table 3. Highest frequency of 4 (four) each was for the keyword *Society.* Next important key words were *Religion* and *Social Anthropology, Social Change, Caste* and *Culture.* The results indicate that he had wide ranging interests in sociology and social anthropology.

Table 3

Key word frequencies in the titles of papers by M.N. Srinivas

S.No.	Key word	Frequency
1.	Society	4
2.	Religion	3
3.	Social anthropology	3
4.	Social change	2
5.	Caste	2
6.	Culture	2
7.	Sociology	2
8.	Philosophy	2
9.	Village Studies	2
10.	Sanskritization	2
11.	State	2
12.	National Integration	2
13.	Revolution	2

Key words from the titles of the articles used only once are presented in Table 4. These key words indicate his wide spectrum of interest, his study methodology and the subjects addressed to in the course of his 53 years of professional career.

The channels (Table 5) where Srinivas had communicated more than 5 papers were:

The Times of India (11), *The Economic and Political Weekly* (7), *The Economic Weekly* (6) and *Sociological Bulletin* (5).

Table 4

Keywords used only once in the titles of papers by M.N. Srinivas

S.No.	Keyword	S.No.	Keyword
1.	Mamaja	44.	Geologists
2.	Family	45.	Mythographers
3.	Mysore	46.	Economy Development
4.	Coorgs	47.	Value
5.	South India	48.	Potter
6.	Bibliography	49.	Priest
7.	India	50.	Rampura
8.	Village	51.	Rural
9.	National building	52.	Urban
10.	Human fertility	53.	Social Pattern
11.	Change	54.	Caste System
12.	Women	55.	Equality
13.	Social structure	56.	Myth
14.	Basic needs	57.	Self Sufficiency
15.	Karnataka	58.	Attitudes
16.	Dowry	59.	Vested Interest
17.	Cohesive Role	60.	Backwardness
18.	Field Worker	61.	Indian Diet
19.	Field	62.	Social Justice
20.	Tamil	63.	Institutions
21.	Folk Songs	64.	Fertility
22.	Telgu	65.	Networks
23.	Social Organisation	66.	Untouchables
24.	Social Work	67.	Inequality
25.	England	68.	Fission
26.	Joint Family	69.	Industries
27.	Despite	70.	Future
28.	Anthropology	71.	Food Habits
29.	Sociological Research	72.	Mobility
30.	Gujarat	73.	Politics
31.	Ayyappa	74.	Scarcity
32.	Daity	75.	Education
33.	Varma	76.	Social Mobility
34.	Waterman	77.	States
35.	Social system	78.	Modernization
36.	Westernization	79.	Sociologists
37.	Industralization	80.	Political Development
38.	Urbanization	81.	North eastern Hill Areas
39.	Radchffu-Brown	82.	Tradition
40.	Customs	83.	Itinararies
41.	Hinduism	84.	Household
42.	Indian Unity	85.	Pakistan
43.	Barrots	86.	Industrialists
		87.	Businessmen

contd.

table 4 (contn.)

S.No.	Keyword	S.No.	Keyword
88.	Indian Culture	115.	Sociology in India
89.	Social Scientists	116.	Reminiscences
90.	Management	117.	Bangalorean
91.	Social Environment	118.	Gandhi
92.	Status	119.	Revolution
93.	Marraige Family	120.	Other Essays
94.	Role	121.	Reality
95.	Field Work	122.	Social Science
96.	Sociology	123.	Social Stratification
97.	Teashop	124.	Kumaoon
98.	Information Centre	125.	Urban Studies
99.	Society and Culture	126.	Urban Despair
100.	Mandal Formula	127.	Indian Women
101.	Encounter	128.	Technology
102.	Dateless Dowry	129.	Science
103.	Berkely	130.	Rural Development
104.	Cultural Ethos	131.	Participant Observation
105.	Centrality	132.	Remembered Villages
106.	Developmental Process	133.	Observer
107.	Employment	134.	Observed
108.	Changing Values	135.	Caste Hierarchy
109.	New Philosophy	136.	Insider
110.	Faith in God	137.	Outsider
111.	Cultural Revolution	138.	Ethnology
112.	Past and Present	139.	Language
113.	Greater	140.	Humbergerology
114.	Malgudi		

** Polish title is not analysed for key words.*

Table 5

Journal-wise scattering of papers of M.N. Srinivas

S.No.	Journal titles/channels of communication	Total papers	Percentage	Cum. %	Period of Journal		Usage
					FPY	LFY	Total no. of years
1.	Aryan Path	1	0.69	0.69	1942 -	1942	1
2.	The Journal of University of Bombay	2	1.39	2.08	1943 -	1944	2
3.	Man	3	2.08	4.16	1946 -	1976	30
4.	Silver Jubilee Volume of the School of Economics and Sociology	1	0.69	4.85	1947 -	1947	1
5.	The Economic and Political Weekly	7	4.86	9.71	1951 -	1995	44
6.	The Journal of the M.S. University of Baroda	2	1.39	11.1	1952 -	1953	2

contd.

table 5 (contn.)

S.No.	Journal titles/channels of communication	Total papers	Percentage	Cum. %	Period of Journal		Usage
					FPY	LPY	Total no. of years
7.	Sociological Bulletin	5	3.47	14.57	1952 -	1994	42
8.	Prof. Ghurye Felicitation Volume	2	1.39	15.96	1954 -	1956	3
9.	The Eastern Anthropologist	2	1.39	17.35	1954 -	1955	2
10.	Village India	1	0.69	18.04	1955 -	1955	1
11.	The Economic Weekly	6	4.17	22.21	1955 -	1962	7
12.	The Far Eastern Quarterly	1	0.69	22.90	1956 -	1956	1
13.	Kannada Gudi	2	1.39	24.29	1956 -	1956	1
14.	Society of India	1	0.69	24.98	1956 -	1956	1
15.	Transport	1	0.69	25.67	1957 -	1957	1
16.	The Journal of Asran Studies	1	0.69	26.36	1958 -	1958	1
17.	The Encyclopaedia Britannica	1	0.69	27.05	1958 -	1958	1
18.	Akashvani	1	0.69	27.74	1958 -	1958	1
19.	Journal of American Folklore	1	0.69	28.43	1958 -	1958	1
20.	Economic Development and Cultural Change	1	0.69	29.12	1958 -	1958	1
21.	Man in India	1	0.69	29.81	1959 -	1959	1
22.	The American Anthropologist	1	0.69	30.50	1959 -	1959	1
23.	The Illustrated Weekly of India	3	2.08	32.58	1959 -	1974	15
24.	Samaj Vikas	1	0.69	33.27	1959 -	1959	1
25.	Spoteczno Ekonomic zne probleny Indic	1	0.69	33.96	1960 -	1960	1
26.	Yojana	2	1.39	35.35	1961 -	1963	3
27.	The Statesman	1	0.69	36.04	1961 -	1961	1
28.	Agricultural Situation in India	1	0.69	36.73	1961 -	1961	1
29.	The Times Survey of India	1	0.69	37.42	1962 -	1962	1
30.	Indian and Foreign Review	1	0.69	38.11	1964 -	1964	1
31.	Scientific American	1	0.69	38.80	1965 -	1965	1
32.	The Gazetteer of India	1	0.69	39.49	1965 -	1965	1
33.	The Times Supplement of India	1	0.69	40.18	1965 -	1965	1
34.	The Times of India	11	7.64	47.82	1967 -	1994	24
35.	The Int. Encyclopaedia of the Social Sciences	1	0.69	48.51	1968 -	1968	1
36.	Education and Social Concern	1	0.69	49.20	1968 -	1968	1
37.	North Eastern Research Bulletin	1	0.69	49.89	1972 -	1972	1
38.	A Survey of research in Sociology and Social Anthropology	1	0.69	50.58	1972 -	1972	1
39.	International Social Science Journal	1	0.69	51.27	1972 -	1972	1
40.	Indian and Foreign Review	1	0.69	51.96	1974 -	1974	1
41.	Research Methodology	1	0.69	52.65	1974 -	1974	1
42.	South Asian Review	1	0.69	53.34	1974 -	1974	1
43.	Tradition and Modernization	1	0.69	54.03	1976 -	1976	1
44.	Village Studies in the Third World	1	0.69	54.72	1977 -	1977	1
45.	Guardian Sp. Report on India	1	0.69	55.41	1977 -	1977	1
46.	Contribution to Indian Sociology	2	1.39	56.80	1978 -	1984	6
47.	Gandhi in Today's India	1	0.69	57.49	1979 -	1979	1
48.	Collier's Encyclopaedia	4	2.78	60.27	1980 -	1993	13
49.	Reviews in Anthropology	1	0.69	60.96	1981 -	1981	1
50.	The Economic Times	1	0.69	61.65	1988 -	1988	1
51.	Miroir De L. Inde	2	1.39	63.04	1988 -	1988	1
52.	Mot. Inden, Kulterhuset	1	0.69	63.73	1988 -	1988	1
53.	South India	1	0.69	64.42	1990 -	1990	1
54.	Anthropology Today	1	0.69	65.11	1992 -	1992	1
55.	Indian Express	1	0.69	66.80	1993 -	1993	1
56.	Papers presented in various meetings, foreword, lectures, conferences, seminars, symposia, bulletins, essays, air broadcasts etc.	50	34.71				
	Total	144	100.00	100.00			

FPY = First paper published year LPY = Last paper published year

A rare phenomenon of a social scientist having publications in 9 different languages can also be observed here. He had published 131 papers in English, 3 each in Gujarathi and French, 2 papers in Hindi and one each in Kannada, Telugu, Tamil, Russian and Polish (Table 6). A professional in sociology and social anthropology extending his subject purview through articles in different languages of the world is a phenomenon to be well applauded.

Table 6

Languagewise scattering of publications of M.N. Srinivas

S.No.	Language	No. of papers published	%	Cum%
1.	English	131	90.97	90.97
2.	Gujarathi	3	2.08	93.05
3.	French	3	2.08	95.13
4.	Hindi	2	1.39	96.52
5.	Kannada	1	0.69	97.21
6.	Telgu	1	0.69	97.90
7.	Tamil	1	0.69	98.59
8.	Russian	1	0.69	99.28
9.	Polish	1	0.69	100.00 (rounding off)
	Total	144	100.00	100.00

The geographic distribution of his publishers is given in Table 7. Out of 144 publications by 1995, 119 articles were published by Indian publishers and 22 articles exclusively by foreign publishers and 3 articles by both. This trend indicates world wide scattering of publications of M.N. Srinivas, which is an example to every student of sociology and social anthropology to know how far the publication activity could be extended.

Table 7

Geographic distribution of publishers of M.N. Srinivas

S.No.	Particulars of publication	Total number of papers	%	Cum%
1.	By Indian publishers	119	82.64	82.64
2.	By foreign publishers	22	15.28	97.92
3.	By both (Published by foreign as well as Indian publishers)	3	2.08	100.00
	Total	144	100.00	

CONCLUSION

Publication productivity analysis of M.N. Srinivas, a successful scientist, carried out here has thrown light on his pivotal contribution to sociology and social anthropology. He has been well received as a *Role Model* by many younger social scientists. Knowledge is valuable for its own sake and research has cultural value. Desire of being creative is built in our genes. Who knows this effect may switch on genes for creativity in some of those who happen to read this article. Narrating success stories always has an encouraging effect [5].

Though Srinivas has written on many aspects of Indian society and culture, he is best known for his works on *religion, village community, caste, social change and methodology*. While most of his writings are based on intensive field work in South India in general and Coorg and Rampure in particular, his writings on Indian society at large provide a synthesis of his personal observation and knowledge and the existing literature at different regions of the country. His concepts of *Sanskritisation* and *dominant caste* have been used by a wide range of scholars to understand Indian society and culture, past and present and have become part of the public discourse in India. The distinction he made between the book view and the field view in the study of analyzations has tremendous significance.

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LIBRARY & INFORMATION SCIENCE (LIS) RESEARCH 1987-1997: A Decade of Development

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A study of ongoing research in any subject field can provide valuable information about the current trends and future direction of the field. Carries out an analysis of theses accepted for award of Ph.D. and research in progress in various Indian universities from 1987 to 1997 trying to provide foundation for examining the performance of library and information science (LIS) research. Presents the results of the study with the goal of broadening the perspectives of the LIS research community and to help them to debate on the nature and proper direction of the research.

Research is an investigation which seeks to increase one's knowledge of a given situation or problem. Research in any subject field is carried out to develop and evaluate the concepts and theories. It is a careful study or investigation to discover new facts or information. It, therefore, requires a systematic analysis and logical interpretation of empirical evidence to confirm or disprove prior conceptions/assumptions.

Any subject field requires continuous research support to develop as a discipline. Library and information science (LIS) research is of recent origin. Though the research in this field started during the second decade this century, substantial growth has been registered during 1990s only. The research studies were carried out mainly by the practitioners particularly those in the academic libraries, faculty and students of schools of Library and Information Science. Raju [1] traced some factors such as rapid changes in information technology, problems faced in management of libraries, UGC norms for career promotion, changing pattern of reading habits of users, desire for recognition and faculty status in the society, which contributed towards the increased interest in LIS research. Feather and Strages [2] remark that "the role and status of LIS research have been the subject of controversy. As a professional field with an emphasis on practice rather than theory, LIS research has been citicised for its lack of rigorous theoretical base for the significance of the research questions addressed and the quality of research methodology employed".

A study of subject trends in LIS research from 1975 to 1990 has revealed library management to be the most popular subject of research [3]. Another significant area of research identified in Atkins study [4] was research on information storage and retrieval systems and databases. A specialized study in LIS research is the statistical study of bibliographic information.

This study has been undertaken by analysing the theses submitted for the award of doctorate and research in progress in various Indian universities from 1987 to 1997. The research work done in field of library and information science only is analysed. For the purpose of this study, analysis of 255 LIS research activities has been carried out.

OBJECTIVES OF THE STUDY

The main objectives of the study are:

i) to find out the nature and direction of LIS research during 1987 to 1997;

ii) to verify the diversity of current research in LIS field; and

iii) to identify the areas of research which are receiving insufficient attention from LIS scholars.

RESEARCH METHODOLOGY

In order to achieve the objectives of this study, an in-depth study of the theses accepted for the award of the doctoral degree and the research studies currently in progress in Library and Information Science discipline during the years 1987 to 1997 has been undertaken. Since the purpose of the study was to find out the direction of LIS research, no attempt was made to differentiate between final theses submitted and research in progress. Hence the term "submission/research paper" is used to represent the final theses accepted for award of doctoral degree as well as research in progress.

The primary goal in carrying out this study for the LIS research community is to provoke further discussion and reflection, rather than to sharply draw any conclusions. In this paper, the stream of LIS research submissions already made and to be made to various Indian universities during the study period has been characterized. This process involved three important steps viz. a) selecting the submissions for review, b) identifying research questions or core concepts of each submissions, and finally, c) classifying those research questions.

Selecting the Submissions

To get a possible panoramic view across the domain of LIS research over a period of time, it was decided to include in the analysis all the 255 LIS research submissions from 1987 to 1997 which included 151 theses for which doctoral degree has already been awarded and another 104 research studies which were in different stages of completion. The required data was culled out from the *University News* - an official newsletter of *Association of Indian Universities*, New Delhi which provides this information.

Identifying the Research Questions

The next step was to identify the research questions or core throght content of the research study. This step involved careful study of all the 255 research titles before writing the research questions. The research questions were formulated using standard phrases to eliminate any ambiguity in the title.

Classifying the Submissions

In order to find out whether there was any convergence around certain fundamental subject categories, all the research questions were classified with the help of Dewey Decimal Classification (DDC). Further these categories were clustered into themes of higher order to sharpen the image of direction of research submission. The individual libraries depending upon their nature of operation were grouped under six categories namely academic; public; industrial; special; government libraries and libraries-abroad.

FINDINGS OF THE RESEARCH STUDY

Characterization of categories

The research questions and their categorization form primary database of the study. However the full text of research questions has been excluded from this article as it occupies substantial space in the report. Instead an attempt has been made to give rich account on core concepts of the study. This included keywords, concepts and associations that appear in the research questions (appendix 1). The elements in the appendix were drawn from the research questions themselves. Appendix 2 gives the yearwise distribution of categories during the study period.

Distribution of Submissions

To begin with, overall distribution of submissions during the study period were made. The yearwise distribution of the submissions has been give in the Table 1.

TABLE 1

Yearwise distribution of research submissions

Sl No	Year	Research Submissions
1	1987	10
2	1988	10
3	1989	18
4	1990	20
5	1991	29
6	1992	33
7	1993	29
8	1994	29
9	1995	34
10	1996	14
11	1997	29
	TOTAL	255

Source: University News 1987 to 1997

Distribution of categories

In order ascertain the direction of LIS research, the pattern of distribution of submissions across the categories was analysed. Table 2 presents the distribution pattern of the categories during the study period.

Table 2

Distribution of submissions across the categories

SLNO	CATEGORY	SUBN
1	Academic Libraries	70
2	Bibliographic/ Biliometric/ Citation Analysis	43
3	User studies	40
4	Information System Design	26
5	Personnel Management	20
6	Public Libraries	13
7	Special Libraries	13
8	LIS Networking	12
9	Library Professionals	10
10	LIS Education	9
11	Library Automation	8

contd.

contn. (table 2)

SLNO	CATEGORY	SUBN
12	Collection Development	7
13	Information Technology	7
14	Classification	6
15	Industrial Libraries	6
16	Libraries-Abroad	6
17	Information Retrieval	5
18	Indexing	5
19	Govt. Libraries	5
20	Cataloguing	3
21	Library and Community	3
22	Thesaurus/Controlled Vocabulary	3
23	Information Management	3
24	Library Legislation	2
25	Marketing of LIS	2
26	Bibliographic Service	1
27	Circulation System	1
28	ComparativeLibrarianship	1
29	Copy Right Act	1
30	CurrentAwareness service	1
31	DBMS	1
32	Documentation Service	1
33	Financial Management	1
34	Information Service	1
35	Informational Role	1
36	Library Association	1
37	Library Building	1
38	Library Management	1
39	Multimedia Technology	1
40	Pub. Rel. in Libraries	1
41	Security against Theft	1
41	Security against Theft	1

Note: SUBN - Research submissions

The distribution pattern of categories indicates that the LIS research is revolving around a few research topics. The research questions associated with each category, which received more than five submissions during the study period, are given below.

The distribution pattern of submissions across the libraries is presented separately.

i) Bibliographic/bibliometric/Citation Analysis

This is a specialized area of research in LIS research. This category was the most popular area of research among the LIS research scholars. Research questions concerned with this category focused on the issues associated with bibliographic analysis of works of Dr. S.R. Ranganathan and P.N. Kaula, Malayalam translated works, Indian contributions, doctoral dissertations, and literature on children, punjabi, sanskrit, hindi, earth sciences, periodicals, physical education, horticulture, social sciences, Kerala's economy and LIS.

ii) User Evaluation and Satisfaction

This is another area, which has attracted many

LIS research scholars. Research questions concenred with this category focused on users' information needs, information seeking behaviour, satisfaction, and evaluation of effectiveness/ utilization of library resources and services. More work can be traced on users' information needs and information seeking behaviour.

iii) Information System Design

Information systems design discusses the ways and means of designing of information systems to improve the efficiency of resources and services. This category concentrated on designing of information systems for agriculture, ayurveda, education, marine fisheries, machine tools, operations research, pharmaceuticals, soil survey and statistical information.

iv) LIS Personnel (Professionals and Personnel Management)

This category focussed on the varied issues on application of personnel administration in libraries, staff training, professional attitude towards technology adoption, managerial role, leadership style, manpower utilization, job satisfaction, job opportunity and performance appraisal. More work has been registered on personnel administration in general.

v) Library/Information Network

Library and information networking explains the problems and prospects of networking and its applications in health, technical and ONGC libraries in India. More work has been done in health information side.

vi) LIS Education

LIS education is the basic requirement for rendering of professional services to the users. Research questions on LIS education cover a range of issues like restructuring, continuing education, attitude for graduate level learning, status of LIS in Karnataka and North India, It also covers two comparative studies of LIS education system in UK and India, and India and Iran.

vii) Automation/Computerization

Research questions on automation deal with studies on information infrastructure facility required, HRD needs and its application in circulation and other operations in special, technical, and medical libraries.

viii) Collection Development

Collection development deals with acquisition of LIS resources. Research questions grouped in this category envelope the topics on acquisition system of maps, nonprint media, archives and serials management.

ix) Information Technology

The research questions in this category shared the goal of explaining applications and impact of IT, job opportunity, and attitude of librarians towards adoption and utilization of IT.

X) Classification

Research questions associated with this category explore various issues of classification such as comparative study of various classification systems, knowledge classification, DDC Expansion for cancer and natural sciences literature.

ix) Indexing

Research questions associated in this category focused on indexing systems, indexing languages, book indexing, and comparative study of different indexing techniques.

Distribution of Submissions and Subjects across the libraries

Table 3 gives the distribution pattern of research submissions across the various libraries. The distribution pattern of subjects across the libraries is presented in Table 4.

TABLE 3

Distribution of submissions across the libraries

Sl No.	Library	Su Bn
1	Academic Library	70
2	Public Library	13
3	Special Library	13
4	Libraries-Abroad	6
5	Industry Library	6
6	Govt. Library	4
7	So.Sci. Library	1

Table 4

Distribution of subjects across the libraries

- Academic Libraires
  - Growth and devp.
  - Collction Developent
  - Library Management
  - Information System Design
    - Health Information
    - Cosumer health
    - Online information
    - Information Mangement
  - Networking /resource Sharing
  - Job satisfaction
  - User study
    - Information needs
    - Library resources and services
    - Information Seeking behaviour

- Industrial Libraries
  - Growth & Devp
  - Networking
  - National Information System
  - User study
    - Library Resources and services
    - Information Seeking Behaviour

- Libraries- Abroad
  - Growth and Devp in Yemen, UAE,Thailand
  - LIS Eduaction- UK , Iran
  - Marketing Of Infn. Products

- Special Libraries
  - Growth & Devp
  - networking
  - Automation
  - Users aStudy
    - Information Needs
    - Information Seeking Behaviour
    - Library resources and services

- Public Libraries
  - Library system in MP, AP. Manipur, Karnataka, WB.
  - Library Legisaltion
  - Pubic Relation
  - Mass Comamunication
  - Profesionals
  - Carrer Development

- Government Libraries
  - Growth & Devp.
  - Publiations
  - User Study
    - Use of Information

Note: General submissions like bibliographic analysis/information system design where library name is not mentioned are not considered for analysis.

a) Academic Libraries (70)

This category consists of the major share of LIS research activity. The specific libraries covered under this category were school, polytechnic, college, scientific/technical, medical, management, distant education and university libraries.

Study on university libraries was one of the most favoured research areas among LIS research community. The research studies explore the issues on acquisition system, collection development, growth and development, library buildings, library services, library management, financial management, personnel administration, networking, role in education policy and S&T research of university libraries.

Research in academic libraries is thus being concentrated more on growth and development, collection development, information system design and less on user studies.

b) Public Libraries (13)

Research questions associated with public libraries included issues like library legislation, library movement, services and public library systems in Madhya Pradesh, Orissa, Manipur, Kerala and Delhi. The concentration of research is on growth and development of libraries.

c) Special Libraries (13)

Defence, geographic, newspaper, railways, R&D, rural and sports libraries research studies converged in this category. The research is concentrated on user studies like assessment of information needs, information seeking behaviour and utilization of library resources and services.

d) Industrial Libraries (6)

This category comprised of studies on ONGC, BHEL, sugar, petroleum, jute and special libraries in Andhra Pradesh. The concentration of research is almost similar to special libraries.

e) Libraries-Abroad (6)

Studies on libraries of BCD, Iran, Kenya, Thailand, United Kingdam and Yemen, is covered in this category. The favoured area of research is growth and development of libraries in these countries.

f) Government Libraries (5)

This category is concerned with government polytechnic, central government and government libraries in Delhi.

In general in academic, public and government libraries, much of research is focussing on traditional library activities. Whereas in special and industrial libraries, attempts are made to understand the customer for better services/ delivery process.

The specific libraries covered under each category of libraries are diagrammatically represented in figure 1. The numbers in the brackets denote the number of submissions during the study period. i.e. from 1987 to 1997.

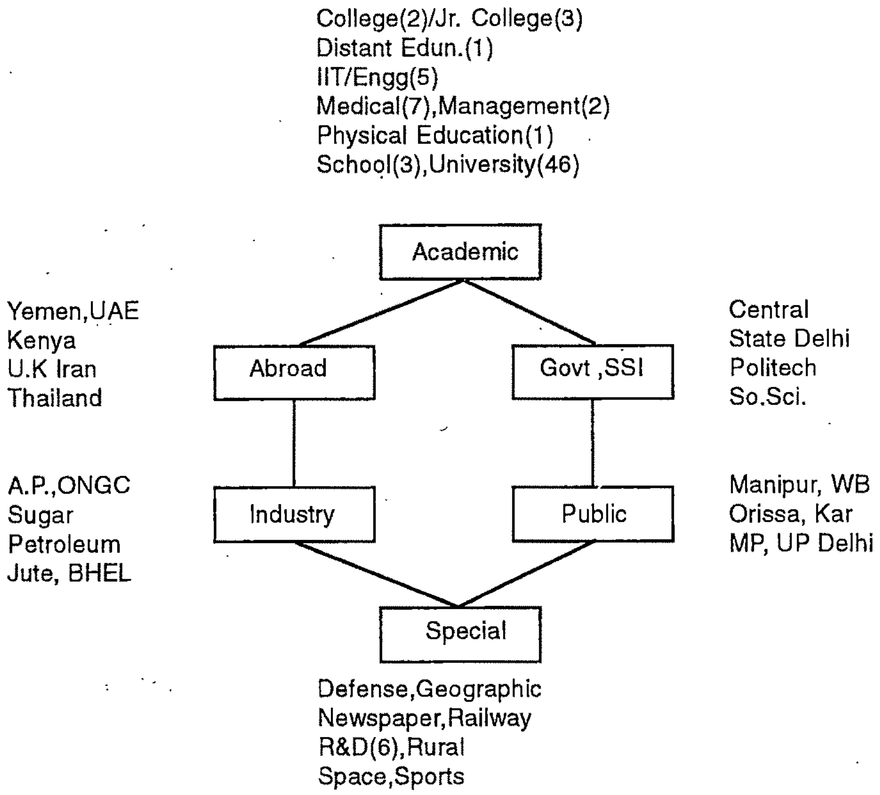


Fig. 1 : Specific Libraries Covered

Distribution of submissions across the Universities and Faculty Guides

The pattern of distribution of submissions across various universities to find out any concentration on any region was also studied. The pattern is given in the Table 5 and the pattern across the faculty guides is given in the Table 6.

Table 5

Universitywise distribution of research submissions from 1987 to 1997

Sl. No	University	Subn
1	Andhra	1
2	Annamalai	1
3	BHU	29
4	Bangalore	6
5	Berhampur	3
6	Bharatidasan	1
7	Bundelkhand	1
8	Burdwan	7
9	Calicut	6

contd.

contn. (table 5)

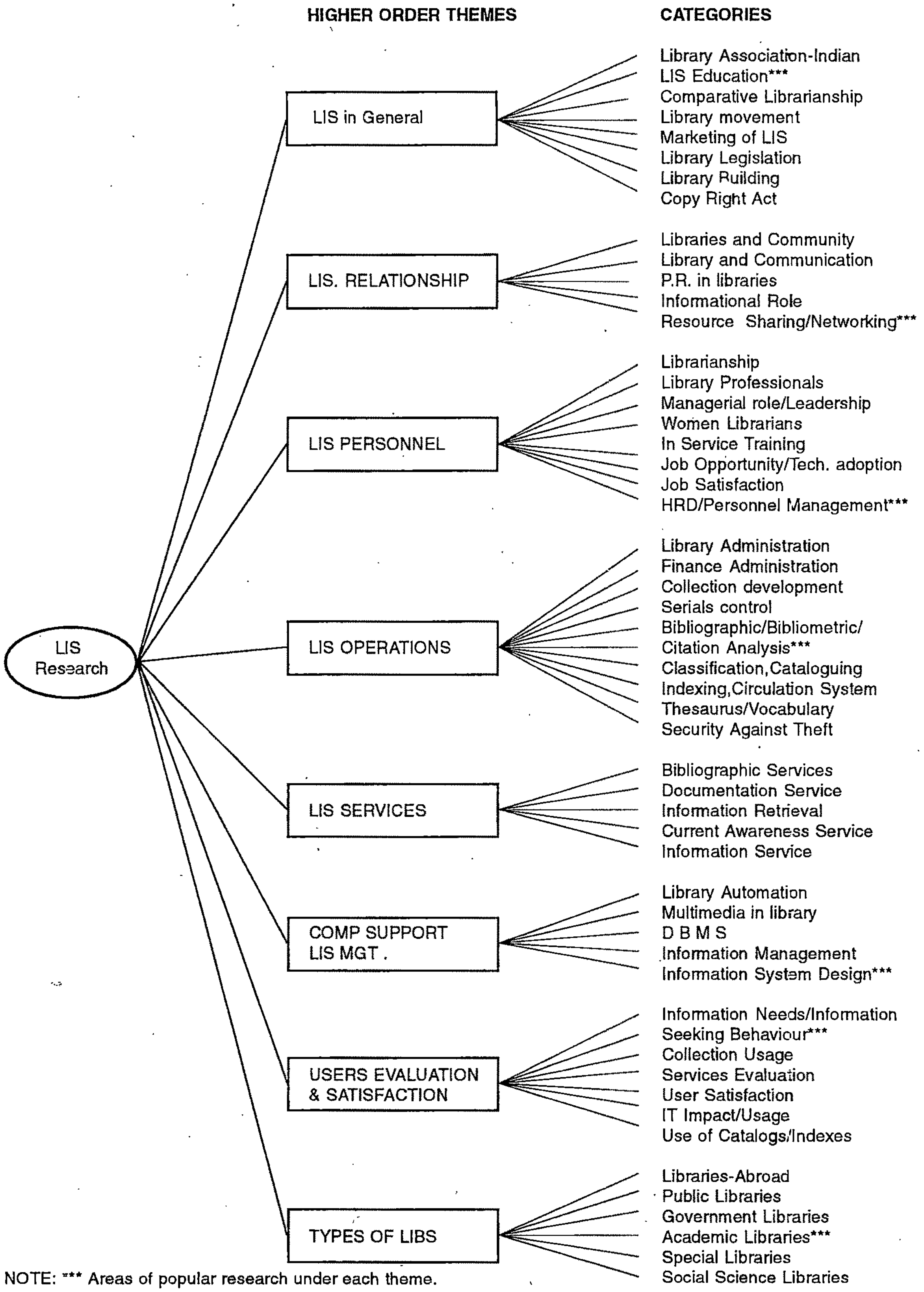
Sl. No	University	Subn
10	Cochin	4
11	Delhi	9
12	Dr. H.S. Gour	16
13	Gulbarga	7
14	Guwahati	1
15	JNU	2
16	Jadavpur	1
17	Jammu	3
18	Jiwaji	16
19	Karnatak	20
20	Kerala	21
21	Kurukshetra	1
22	Kuvempu	2
23	Madras	4
24	Manipur	5
25	M.Sukhadia	1
26	Mysore	1
27	Nagpur	4
28	N.E.Hill	2
29	Osmania	4
30	Padmavati	2
31	Poona	2
32	Punjab	22
33	Punjabi	2
34	pt.Ravishanlkar	2
35	Rajasthan	5
36	Sambalpur	6
37	Shivaji	1
38	SNDT	2
39	Utkal	2
40	Vikram	12

1	TOTAL NORTH REGION	98	3	TOTAL EAST REGION	29
2	TOTAL SOUTH REGION	75	4	TOTAL WEST REGION	53

Table 6

Distribution of research studies across the faculty guides

Slno	Submissions guided by each faculty guide	No. of faculty guides	Total no. of Submissions
1	7 to 10 and above	7	72
2	4 to 6	11	50
3	2 to 3	18	48
4	1	40	40
5	Guide name not mentioned	45	45



NOTE: *** Areas of popular research under each theme.

Fig. 2 : Relationships among Categories and Themes of Higher Order

Distribution of submissions across the themes of higher order

In order to get a clear picture of direction of LIS research; the categories mentioned earlier in this text (Table 2) were further grouped into eight themes of higher order. The grouping pattern and the terminology were borrowed from the Dewey Decimal Classification. The clustering of categories around each themes of higher order is shown in Fig. 2 and the distribution pattern of submissions across the broader themes is presented in Table 7.

Table 7

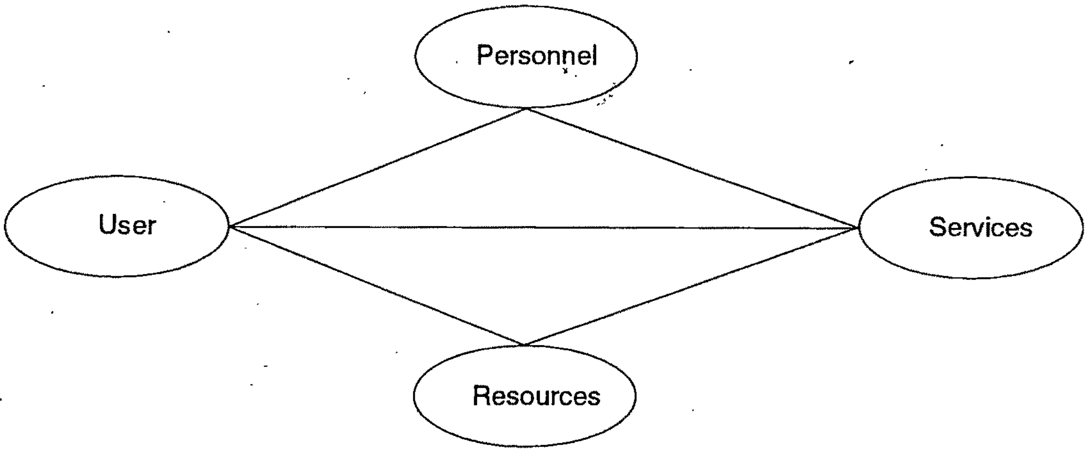
Yearwise distribution of themes of higher order

Sl. No	Themes	87	88	89	90	91	92	93	94	95	96	97	Total
1	LIS in General	-	1	1	2	2	2	2	2	1	1	1	15
2	LIS Relationships	1	-	1	2	4	4	-	3	1	2	1	19
3	LIS Personnel	-	2	2	1	3	5	3	2	-	1	2	21
4.	LIS Operations	4	3	7	5	7	10	5	7	12	4	6	70
5.	LIS Services	1	4										5
6.	Computer Supported LIS Mgt.	3	2	1	4	2	1	3	4	7	3	3	33
7.	User Evaluation and Satisfaction	1	-	1	3	7	2	6	4	9	1	6	40
8.	Specific Libraries*	1	1	1	4	4	9	10	7	3	2	2	44
	Total	10	10	18	20	29	33	29	29	34	14	21	255

* Study on overall aspects is considered. Specific studies are listed in respective classified categories.

Relationships among the categories and higher order themes

Dewey decimal Classification has been used to derive headings taking into account the hierarchical, horizontal and vertical relationships that exist among the broader and narrower subject areas. An ILO programmed book on LIS services in management education institutes [5], remarks that all libraries whether they are small, medium or large operate as systems composed of four major components viz. users, resources, personnel and services. the relation between these components can be represented diagrammatically as follows:



All these four components have direct relationships with one another. The present study traces other components such as computer supported information management, library relationships, which are supplement to the qualitative output of any library. The library services and operations are greatly affected by the specific nature of the library. Any library should fulfill the mission and objectives of the parent organization. hence the type of library has been considered as an another component, which supports the four major components. the modified diagram of ILO model is presented in Fig 3.

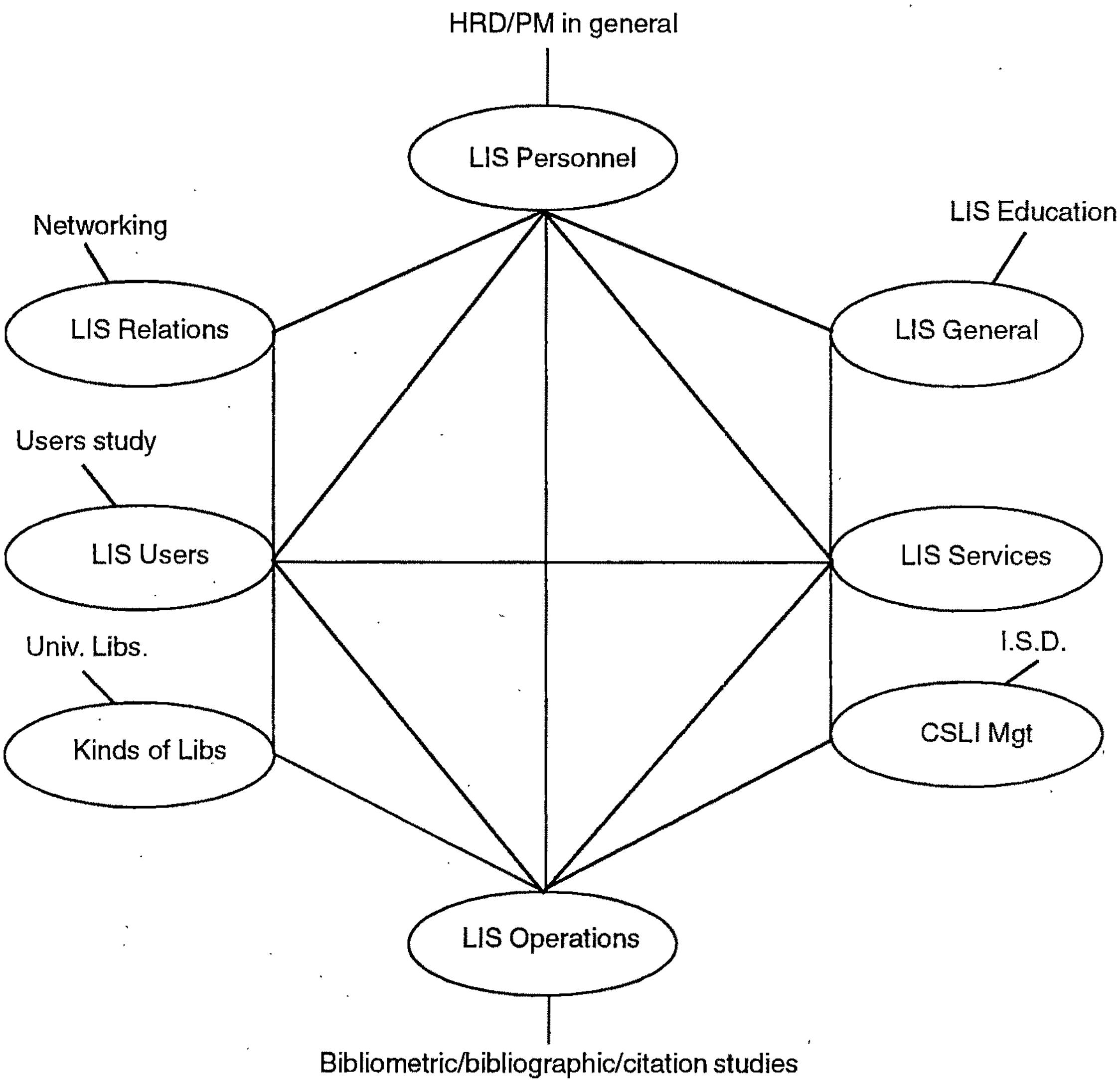


Fig. 3 : Relationship among the higher order themes

Note : Categories outside the relationship chain are the popular areas of research in each theme. LIS Operations includes resources, and the process of acquisition and other activities.

LIS Personnel have direct links with LIS in general and networking and LIS education has major impact on staff for effective services. Likewise LIS services closely relate to LIS in general (LIS education) and computer supported LIS management. Similarly LIS relationships and types of libraries influence the users' information seeking behaviour and effecrive utilization of resources. It must be noted that library operations are greatly affected by users, LIS personnel and services. LIS services and computer supported library and information management have been projected as separate themes of higher order as they are closely associated with the users.

DISCUSSIONS

Based on the primary objectives reported earlier in this paper and the findings of the study, presented below are some broad issues, which are worth consideration.

a) What does the distribution pattern in LIS research submissions depict about the developments in LIS research?

b) Does the submission stream give any clear picture of the direction of LIS research?

c) How well does the submission stream reflect the diversity of current research in LIS field?

d) Does the submission stream suggest that there are areas of research, which are receiving insufficient attention from LIS scholars?

e) How well are we directing our attention towards the emerging areas?

f) Is it too early to consolidate our research agendas around a set of issues?

g) Does the submission pattern across the subject areas (categories), universities and faculty guides indicate:

   i) Reservations/hesitation to go for any innovative research by LIS professional?

   ii) Lack of availability of competent faculty guides?

   iii) Lack of adequate research and infrastrucural facilities available to research scholars in Indian universities?

   iv) Duplication/parallel nature of research studies?

   v) Defective/noncooperative reporting system by Indian universities in *University News* which is a common and easily accessible communication platform?

As mentioned earlier, the primary objective is to help the LIS research community to debate on the issues rather than to draw some sharp conclusions. A national level debate is certainly desirable to find out answers for these issues. However presented in the next section are the guidelines to fuel the debate.

OBSERVATIONS

On basis of the findings of this research study, the following observations can be drawn:

a) The overall distribution of submissions over the years indicates that the second half of the study period has attracted more research scholars.

b) It has been observed that bibliographic analysis (including bibliometric and citation study), users studies in particular, user's information needs and information seeking behaviour, design of information systems, were some of the most popular subjects of research followed by HRD in libraries, LIS professionals, networking and LIS education in India during 1990s.

c) Academic libraries, in particular, university libraries occupy major share of research followed by public, special, industrial, government and social science libraries in that order.

d) It is opined that the categories which received more than ten submissions during the study period indicate the direction of current research of LIS.

e) Further the concentration among the few categories signals the lack of diversity in the subject areas and reservations/hesitation of LIS professionals to go for any innovative research.

f) The LIS research submission across the universities reflects the lack of adequate research and infrastructural facilities available to research scholars in Indian universities.

g) Even among the top performed universities, the research study was concentrated on few areas like bibliographic study, information system design, and networking which reflects the duplication/parallel nature of research studies.

h) The research output with regard to supervisors highlights the lack of availability of sufficient and competent faculty guides.

i) The pattern of distribution of submissions across the categories indicates that there are many areas of research which do require much attention of LIS research community. The subject areas with one or two submissions during the study period, need to be considered for further research by LIS professionals.

LIMITATIONS

The primary source for this study is *University News* an official newsletter of *Association of Indian Universities*, which publishes the data on theses accepted for the award of Ph.D. degree and research in progress. All the universities are supposed to send the research data periodically for publication in *University News*. Entire analysis and interpretation of this study is based on the data available in the newsletter.

DIRECTIONS FOR FUTURE RESEARCH

The study reveals that some of the directions for further research are:

i) The present study revealed that the subject areas like LIS education, industrial relations, marketing of library and information services, market oriented LIS education, customer satisfaction, TQM in LIS, status of LIS professionals in society, models for market research methodologies for understanding of customers, appropriate research models for statistical data analysis, technical capability of LIS professionals, financial administration, LIS networking, innovations in LIS services and buildings have not received the desired attention of the scholars.

ii) Developments in information technology are playing a major roles in administration of library services. CD-ROM, multimedia, Internet and Intranet technologies are giving great threat to the delivery process. The emphasis has been shifted from production centre to customer centre. This study indicates that the LIS research is not much progressing towards this emergent phenomenon.

iii) Service quality, service marketing, relationship marketing, people empowerment and participative management is gaining much importance in service organizations (both nonprofit and service industries). These areas have not yet been touched by LIS research community.

CONCLUSION

The LIS research has shown an upward trend during 1990s which is an encouraging sign of increased interest and confidence among LIS professionals in research activities and definitely this trend will attract more and more researchers.

Enger [6] points out that LIS research is sometimes criticized for using descriptive rather than inferential statistics and is generally lacking in quantitative methods. He responds to the criticism with an argument that "LIS research is often concerned with intangible things like services, behaviour etc. which is difficult to quantify. Instead, the research should concentrate on qualitative output". Quality is today's buzzword in service as well as manufacturing sector. Therefore in order to get qualitative output, it is desirable for the universities to organize and conduct orientation and training programmes on research methodology and arrange special lectures on research topics by the experts in the field. Such programmes will facilitate the researchers to obtain clear understanding of research methodology and to use appropriate statistical tools for data analysis.

The analysis for this study was carried out on the basis of the data available in *University News.* All the universities are supposed to send the data on research studies regularly to *University News* for publication. If the data published is exhaustive, the LIS research definitely requires stong encouragement. Otherwise, it is desirable that the LIS schools/associations/AIU should take initiative to compile an exhaustive and up to date status report on LIS research and build strong coordination for an uninterrupted flow of information. The report should be made available in all the universities and research institutions to avoid any duplicate/parallel research. INFLIBNET should come forward to compile such a report and provide on-line information services to the research scholars.

Sponsorship/financial assistance plays a major role in promoting the research activity. As in other subject fields, the associations, universities and other agencies should find sponsors for conducting research in untouched areas, which have not received the desired attention of the scholars.

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APPENDIX-1

KEYWORDS, CONCEPTS and ASSOCIATIONS

ACADEMIC LIBRARIES
- College Libraries
  - Growth & Devp.
  - Teacher Edun.
- Distant Edun. Libs
  - Library Services
- Engg/Tech.Libraries
  - Collection Devp.
  - Networking
  - Job Satisfaction
  - Users Study
    - Infn. Seeking Beh.
- Medical Libraries
  - Health Infn. System
  - Consumer Infn. System
  - Networking
  - Infn. Management
  - Users Study
    - Library Services
- MGT. Edun. Libraries
  - Thesaurus Construction
  - Users Study
    - Library Services
- Physical Edun. Libraries
  - Growth & Devp.
  - Library Services
- School Libraries
  - Growth & devp.
  - Library resources
- University Libraries
  - Acquisition System
  - Application of IT
  - Building
  - Collection Devp.
  - Financial Administration
  - Growth and Devp.
  - Infn. Services
  - Library Usage
  - Management
  - New Edun. Policy
  - Personnel Administration
  - Resource Sharing
  - Role in S&T
  - Science & Technology
  - Serials Control
  - Users Study
  - Library Services

AUTOMATION
- Attitude of Staff
- Circulation System
- HRD Needs
- Infn. Infrastructure
- Librarians' Resistance
- Medical Libraries
- Special Libraries
- Technical Libraries

BIBLIOGRAPHIC ANALYSIS
- Chemical Literature
- Children Literature
- Earth Science
- Hindi Reference Sources
- Horticultural Literature
- Indian's Contribution
- Kerala Economy
- LIS Literature
- LIS Ph.D Theses
- Malayalam Journals
- Malayalam Translations
- Periodicals Publications
- Ph.D Theses
- Physical Edun.
- Phytopathology
- Punjabi Sanskrit Literature
- Science Journals
- Social Sciences
- SRR and P.N. Kaula Works
- Thai National Library

BIBLIOGRAPHIC SERVICES

BIBLIOMETRIC ANALYSIS
- See Bibliographic Analysis

CATALOGING
- Impact of Ranganathan
- Rendering of Names
- Since Cutter

CIRCULATION SYSTEM
- Automation

CITATION ANALYSIS
- See Bibliographic Analysis

CLASSIFICATION SCHEME
- Cancer Literature
- Comparative
- DDC
- DDC Expansion
- Knowledge Classification
- Natural Science

COLLEGE LIBRARIES
- Growth and Devp.
- Teachers Edun.

COLLECTION DEVP.
- Acquisition System
- Archives
- College Libraries
- Comparative Librarianship
- Map Collection
- Non Print Media
- Serials Management
- Special Library

CONTENT ANALYSIS
- LIS Books

COMPUTERIZATION
- See Automation

COPYRIGHT ACT

DISTANT EDUN. LIBs
- Library Services

DOCUMENTATION

ENGINEERING LIBs.
- Collection Devp.Networking
- Job Satisfaction
- Users Study
  - Infn. Seeking Beh.

GOVT. LIBRARIES
- Central Govt.
  - Users Study
    - Infn. Usage
- State Govt.
  - Publications
- Polytechnic, Delhi
  - Growth & Devp.

HRD/PERSONNEL MGT.
- Attitude-Tech. Adoption
- HRD Needs in Libs.
- In Service training
- Job Opportunities
- Job Satisfaction
- Leadership Style

- Managerial Role
- Manpower Utilization
- Merchants Performance
  - Measurement Model
- Personnel Administration
- Professional Attitude/Quality
- Resistance to Automation
- Women Librarians

INDEXING
- Comparative Study
- Book Indexing
- Indexing System
- Indexing Languages

INDUSTRIAL LIBRARIES
- A.P.
  - Growth & devp.
- BHEL, ONGC, Jute
  - Networking
  - Users Study
    - Infn. usage
    - Infn. Seeking Behaviour
    - Library Utilization
- Sugar Industry
    - National Infn. System

INFORMATION NEEDS
- Agricultural Scientists
- Defence Scientists
- Economists
- Historians
- Journalists
- Library Users
- Ph.D. Scholars
- Physics and Chemistry
- Professionals
- Rubber Scientists
- Social Scientists
- Silk Scientists
- University Teachers

INFN. PROC. BEHAVIOUR

INFN. SEEKING BEHAVIOR
- See Information Needs

INFORMATION NETWORK
- Health Science
- ONGC Libraries
- Rural
- Technical Libraries

INFORMATION RETRIEVAL
- Formation of Subjects
- Soil Mechanics
- System/Tools
- Terminology

INFORMATION SERVICES

INFORMATION SYSTEM DESIGN
- Agriculture
- Ayurveda
- Education
- Fisheries
- Legal
- Machine Tools
- Medical Colleges
- O.R. Techniques
- Online Bibliographic
- Pharmaceuticals
- Planning and Devp.
- Retrieval System
- Soil Survey
- Statistical
- Sugar Industry

INFORMATION TECHNOLOGY
- Applications
- Attitude it Usage
- Impact on Library
- Job Opportunity
- Library Staff Attitude
- Technology Adoption

LIBRARIANSHIP
- in Muslim Rule

LIBRARIES
- Abroad
- U.A.E, Iran, Thailand
  - L&I Centres/Services
- Jordan
  - Marketing Infn. Products
- U,K., Iran
  - LIS Education

LIBRARIES
- Abroad
- Academic
- Govt.
- Industry
- Social Science
- Special Libraries

LIBRARY & COMMUNITY

LIBRARY & SOCIETY

LIBRARY ASSN. INDIAN

LIB. COMMUNICATION

LIBRARY LEGISLATION
- Rajasthan

LIBRARY MANAGEMENT
- Distance Edun. Libraries

LIBRARY MOVEMENT

LIBRARY NETWORK
- Health Science
- ONGC Libraries
- Rural
- Technical Libraries

LIBRARY ORIENTATION

LIS EDUCATION
- continuing
- Grad. level Learning
- India & UK
- India and Iran
- Karnataka
- North India
- Rajasthan & M.P.
- Restructuring
- Yemen

LIS PROFESSIONALS
- Attitude-Tech. Adoption
- Leadership Style
- Managerial Role
- Professional Attitude.
- Professional Quality
- Resistance to Automation
- Women Librarians

MANAGEMENT EDUN. LIBs
  - Thesaurus Construction
  - Users Study
    - Library Services

MEDICAL LIBRARIES
- Health Infn. System
- Consumer Infn. System
- Networking
- Infn. Management
- Users Study
- Library Services

MARKETING OF
- Agri. Infn. Products
- Infn. Products

MULTIMEDIA IN LIBRARY

NETWORKIN/NETWORKING
- Health Science
- ONGC Libraries
- Rural
- Technical libraries

PHYSICAL EDUN. LIBRARIES
- Growth & Devp.
- Library Services

PRE CO-ORD. INDEXING

PERSONNEL MGT/HRD
- Attitude to Tech. Adoption
- HRD in Libraries
- HRD Needs
- In Service Training
- Job Opportunities
- Job Satisfaction
- Leadership Style
- Managerial Role
- Manpower Utilization
- Merchants Performance
  - Measurement Model
- Personnel Administration
- Professional Quality
- Resistance to Automation
- Women Librarians

PUBLIC LIBRARIES
- Growth & Devp.
  - Delhi, M.P., Manipur,
  - Kerala, Orissa
- Library Building,
- Legistation
- Movement in M.P.
- Public relations
- System, Services
- Tribal Community

PUBLIC REL. IN LIBRARY

RESOURCE SHARING
- Health Science
- ONGC Libraries
- Rural
- Technical Libraries

SECURITY AGAINST THEFT

SPECIAL LIBRARIES
- Defense Libraries
  - Users Study
    - Infn. Needs
    - Use of Standards
- Geographic Libraries
  - Growth & devp.
  - Users Study
    - Library Usage
- Newspaper Libraries
  - Users Study
    - Infn. Needs
    - Infn. Seeking Beh.
- Railway Libraries
  - Growth & devp.
- Res. & Devp. Libraries
  - Growth & devp.
  - Networking
  - Automation
  - Users Study
    - Library Services
- Rural Libraries
  - Networking
- Sports Libraries
  - Library Services

TECHNICAL LIBRARIES
- Colllection Devp.
- Networking
- Job Satisfaction
- Users Study
  - Infn. Seeking Behaviour

TECHNOLOGY ADOPTION
- Attitude Study
- Librarians resistance
- Infn. Infrastructure
- Library Role

THESAURUS

Management

Pre Co-Ord. Indexing

UNIVERSITY LIBRARIES
- Acquisition System
- A.P./U.P.
- Application of IT
- Archives
- Building
- Collection Devp.
- Financial Admn.
- Growth and Devp.
- Infn. Service
- Library Usage
- Management
- New Edun. Policy
- Personnel Admn.
- Resource Sharing
- Role in S&T
- Science & Tech.
- Serials Control

USER STUDIES
- Catalog/Index Usage
- Infn. Need
- Infn. Seeking Beh.
- Infn. Sources Usage
- Library Collection
- Usage of Infn. Sources
- Attitude
  - Library Usage
- User Satisfaction
- Resource Evaluation
- Service Evaluation

APPENDIX- 2

YEARWISE DISTRIBUTION OF CATEGORIES

CATEGORIES	87	88	89	90	91	92	93	94	95	96	97	TOTAL
Bibliographic/Bibliometric/ Citation Analysis	3	1	1	2	5	6	4	5	8	2	6	43
Bibliographic Service			1									1
Cataloguing						1		2				3
Classification		2	1			2				1		6
Circulation System							1					1
Collection Development			2	2	2			1		1	1	9
ComparativeLibrarianship				1								1
Copy Right Act									1			1
Service			1									1
DBMS									1			1
Documentation Service		1										1
Financial Management						1						1
Govt. Libraries						1				1		2
Information Management						1				1	2	
Information Retrieval			1									1
Information Service			1									1
Information Sys. Design	2	2	1	4	1		2	3	3	3	5	26
Information Technology						1			2		1	4
Informational Role	1											1
Indexing	1		1	1			1		1			5
Libraries-Foreign		1				2			1			4
Library Association									1			1
Library Automation	1				1				1			3
Library Building		1										1
Library and Community				1		2						3
Library Education			1		2	2	1	1	1	1		9
Library Legislation				1							1	2
Library Management			1									1
Library Professionals		1	1	1		1	3	1		1		9
Multimedia in Library								1				1
Marketing of L.I Service								1			1	2
Networking/Resource Sharing				1	4	2		2	1	2	1	13
Personnel Management		1	1		3	4		1			4	14
Public Libraries	1			1	1	1	1	2			1	9
Pub. Rel. in Libraries			1									1
Security against Theft				1				1				1
social Science Libraries					1							1
Special Libraries			1	1	2	4	2	2				12
Thesaurus/Controlled Voc.			1						2			3
User Studies	1		1	3	7	2	6	4	9	1	6	40
University Libraries				2		1	7	2	2	1	1	16
Total	10	10	18	20	29	33	29	29	34	14	29	255

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